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JUNE 1966
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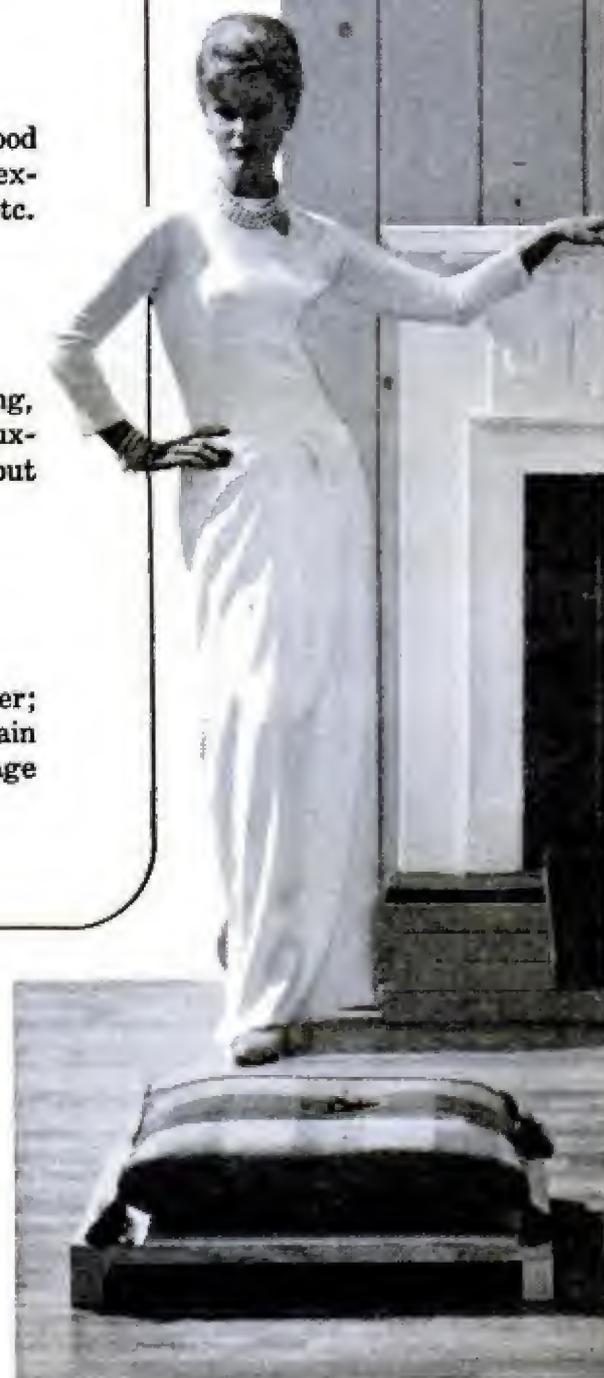
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ADDRESS COMMUNICATIONS TO: 575 Lexington Ave., New York, N.Y. 10022.
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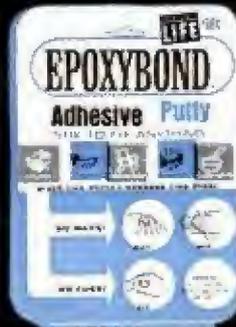


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LETTERS

TO THE EDITOR

For barefoot skiing

My *Hydro Dynamic* (page 144, March '63 *PM*) has touched 50 mph—and is probably near 45 in this photo.

With a 75-hp motor, this boat does a good job of pulling me barefoot—and that



is the primary reason it was built. We love it.

St. Paul, Minn.

DON MURRAY

Bigger little truck

My version of the mail truck (*Fun for Junior Mailmen*, page 174, Feb. *PM*) is considerably larger than the plans.

Automotive-type knuckle steering was used in place of that shown in the plan,



along with larger eight-inch diameter wheels. The headlights on the truck are

(Please turn to page 8)

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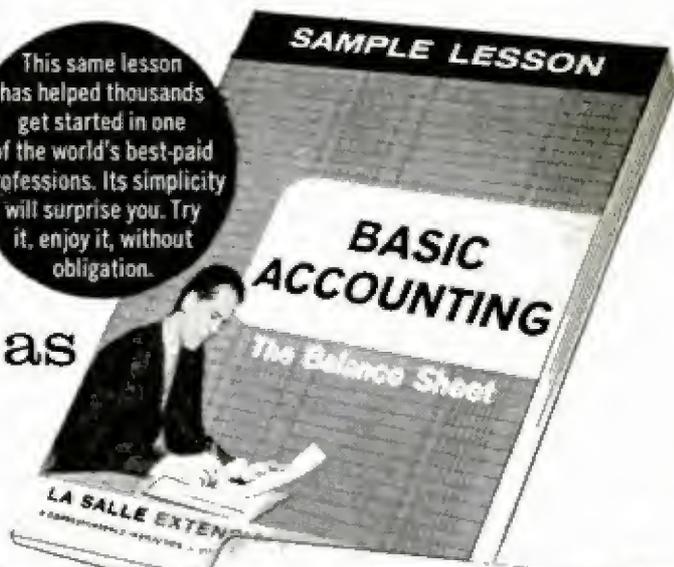
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LETTERS continued

Chevy backup lamps, battery powered.

Assembly time was about three weeks of evenings and weekends. Total cost of materials was about \$55.

Connersville, Ind.

DAVID L. HIDAY

Blacksmith in Brooklyn

I was particularly stirred by the article *Whatever Became of the Village Blacksmith?* (page 106, Nov. '65 PM) as I dabble in this field in my spare time.

With a shop set up in my basement, I'm perhaps the only blacksmith in Midwood-Flatbush. I'm also a student at Brooklyn Technical High School.

I have been interested in blacksmithing almost from the time I could walk. My smith's anvil was sold to me by a blacksmith in Rockport, Mass. It's a 120-pound solid forged Sheffield steel anvil, built in the 19th century in England by Peter Wright. (Getting it home to Brooklyn was



really fun; it kept dragging our car nearly off the road.)

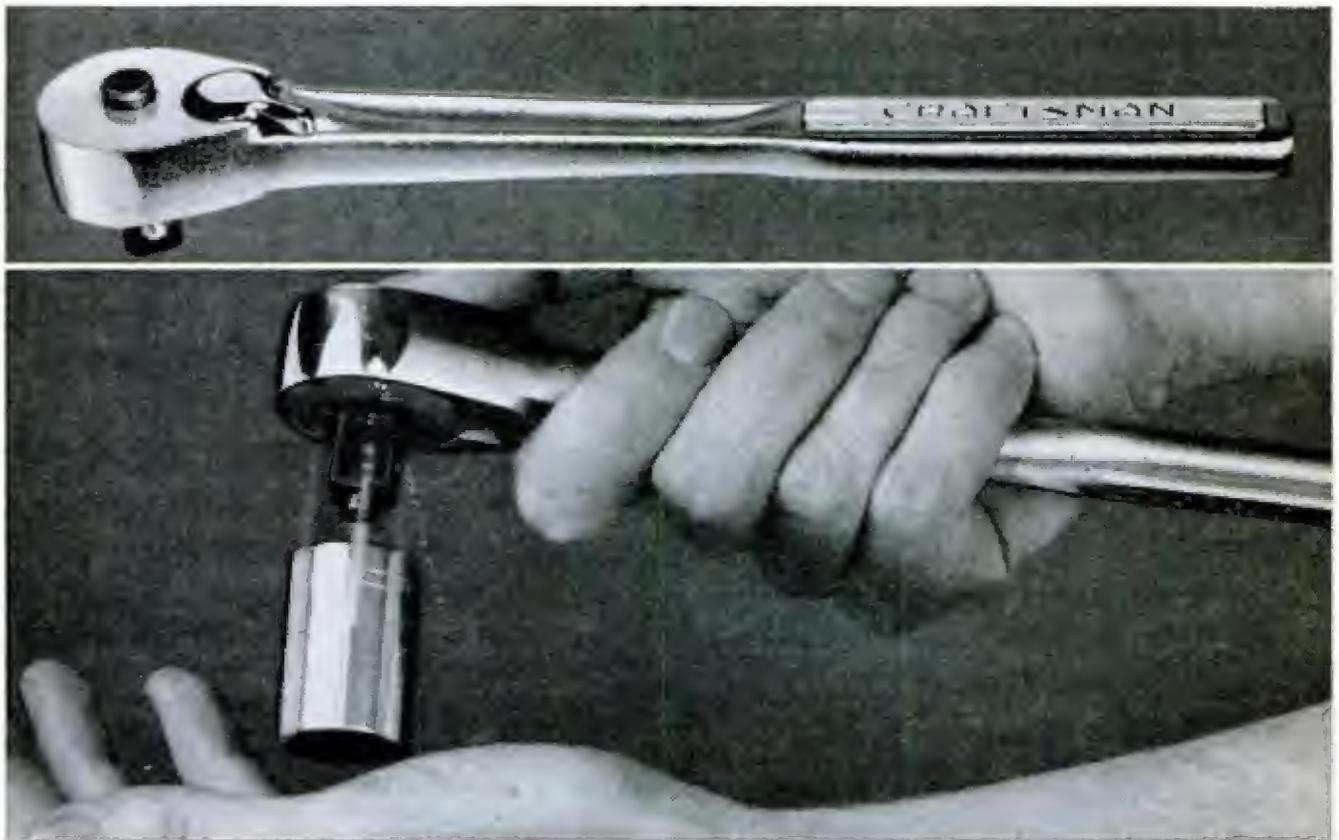
Last June, for \$14.50, I got a Buffalo forge, built in the late 1800s for the Navy. Never used, it had been lying in a warehouse for 40 years. I tied in a smoke line to our two-flue chimney, put in a good refractory lining and laid in 100 pounds of charcoal and 110 pounds of coke.

I've made horseshoes, but I never really have shod a horse; I'm afraid it might be traumatic for the horse. I stick to the other phases of smithing and make and repair things for my neighbors.

Again, many thanks for your fine article. Brooklyn, N.Y.

JOE MICHAELS

Push-button ratchet wrench releases without a fight. New and only at **Sears**



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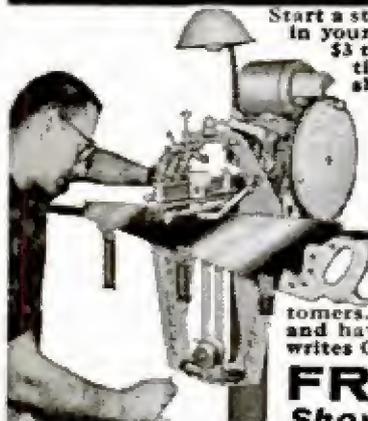
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FROM THE PATENT OFFICE **NEW INVENTIONS**

BY M. J. PEDERSEN

Digital computer that teaches and programs itself can read any language, providing the language is identified and the frequency count of its letters is known. Receiving patent 3,237,161, Jacob Rabinow, Rockville, Md., explained the method as follows: The computer scans the first couple of paragraphs, noting in its memory the frequency of each letter. Such a count enables the computer to distinguish between, say, "e" and "s." From here it begins reading words. Wiring a "dictionary" to the computer would clear up any ambiguities occurring at this point, Rabinow noted. He likened this method to that used by cryptographers in breaking coded messages.

Plastic glue mends broken bones, sets in a few minutes and hardens in a day. Receiving patent 3,223,083 for this method of holding skin and other tissue together, Dr. Milton C. Cobey assigned patent rights to the directors of Georgetown University, Washington, D. C.

Decoder for pay TV system tested in Hartford, Conn., earned patent 3,238,297 for Myron G. Pawley, Riverside, Calif., and Jacob M. Sacks of Corona, Calif. Attached to home TV sets, the decoder is the key to the system inasmuch as it clarifies the video and audio signals, which are sent out "scrambled."

Weed killer chemicals for controlling undesirable vegetation, particularly along highways or railroad tracks, were awarded a total of seven patents—2,235,357 through 2,235,363. All rights were assigned to E. I. du Pont de Nemours and Co., Wilmington, Del., by the inventors, Dr. Harvey M. Loux, Edward J. Soboczenki, Donald S. Acker, Linus M. Ellis and Raymond W. Luckenbaugh.

The 1966 International Inventors and New Products Exhibition will be held at the Coliseum in New York City, September 9 through 18. Inventors interested in displaying new products may obtain a booth for \$180 by registering with the sponsors, Patent Exhibits, Inc., 554 Fifth Avenue, New York, N.Y. 10036. Entries needing financial backing are expected from all 50 states, plus several foreign countries.



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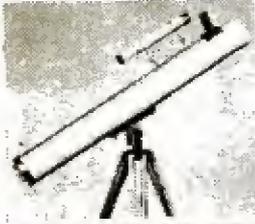
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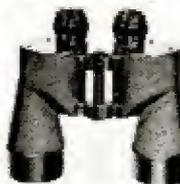
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BY JOHN F. PEARSON SCIENCE WORLDWIDE

If you feel pooped a good deal of the time, you might be a victim of polluted air. So says Dr. John T. Middleton, director of California's Air Pollution Center, who identifies ozone as the chemical culprit. This highly reactive form of oxygen, which is formed in polluted air, slows down animals by closing down part of their lungs, forcing them to use more energy to get the oxygen they need.

There's value in space junk. British scientists report that there are some 200 objects now in orbit capable of serving as passive reflectors of radio messages. Some 10,000 are expected to be in orbit by 1975. The scientists say the orbiting junk could be used as a reliable standby system for communications in a military emergency.

Cereal in your morning paper? Government scientists are starting research on how starch, flour and other products made from corn, wheat and sorghum might be used in the manufacture of paper. Such products might be used with the conventional wood pulp to improve the strength of paper, to bond it and to serve as a coating.

A new way of branding livestock employs intense cold. It's better than hot branding, say Department of Agriculture researchers, because it's painless and causes less hide damage. All it takes is a 30-second application of a copper brand chilled in a dry ice-alcohol bath to minus 158° F.

Checkup needed for sick stethoscopes. Doctors at the University of Michigan Medical Center tested 17 different stethoscopes and found that no two of them performed alike. It's very possible, the researchers say, that physicians are overlooking important signs of illness because of built-in errors of their stethoscopes. They advise practitioners to shop for these instruments with all the care of the hi-fi enthusiast.

Penicillin mystery solved. For 37 years—ever since the discovery of penicillin—scientists have been puzzled by its ability to kill bacteria that invade the body without killing normal cells. Now scientists at the University of Wisconsin have come

up with the answer: The antibiotic stops invading bacteria from building their own cell walls, without which the bacterial cell can't maintain its stability. Human and other animal cells, on the other hand, do not need or have cell walls.

Tiny radio transceiver with a 10-mile range has been developed by a British firm. The 23-ounce FM "Courier" works on three channels, needs no aerial and can be worn beneath outer clothing. A miniature microphone and speaker clip behind the user's lapel.

Tattoos erased by laser—that's the most recent medical accomplishment with this remarkable scientific tool. Dr. Robert G. Wilson of the University of Cincinnati reports that the procedure is nearly painless and results in a minimum of scarring. Warts, horny growths and other non-inflammatory skin lesions can also be treated with good results.

Solar-electric propulsion of unmanned spacecraft to Mars appears to be entirely possible by the mid-1970s. That's the opinion of NASA scientists who describe a craft with four solar cell panels of 5000 square feet (a tremendous surface compared to the 70-square-foot panels used on Mariner IV in its 1965 Martian probe).

Power supplied by the big panels would be harnessed to a set of small ion-chamber engines. According to the NASA experts, solar-electric units appear to be the logical intermediate step between chemically powered and nuclear-electric powered spacecraft.

Man-made "northern lights." A high-speed proton gun is used by scientists at the University of Alaska to create auroral activity in the "test tube." Until now, the study of the mysterious auroral light in the atmosphere had to depend on the occurrence of the real thing, with scientists scrambling to make quick observations.

With the proton gun, researchers are able to create in the lab the same collision that occurs between particles in the regular aurora. The gun fires protons at very high speed into atmospheric gases (such as nitrogen) and the resulting collisions produce light, which can then be leisurely examined with a spectograph.

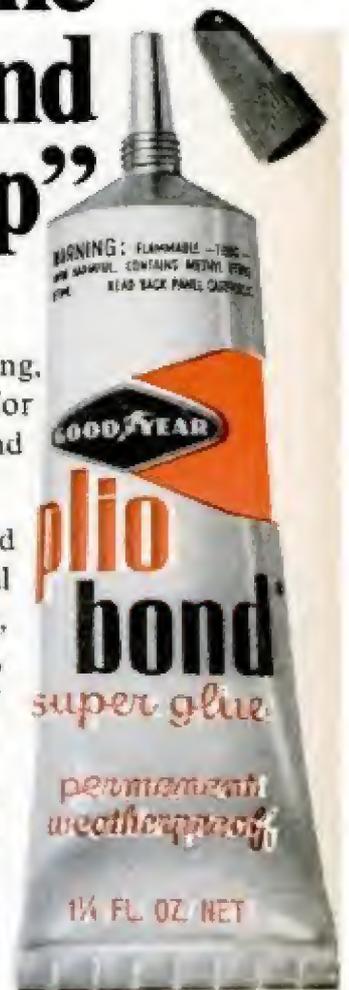
New for drive-ins is a system that broadcasts movie soundtracks through your car radio or transistor, eliminating the need for stanchion-connected speakers. The system uses a clear-channel AM frequency to prevent possible interference with other radio transmissions.

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1. Describe in 50 words, or less, an interesting and unique use for Pliobond adhesives. Use an entry coupon from your local store, or plain paper no larger than 8½ x 11 to enter.
2. Send as many entries as you like to Pliobond Stickup Contest, P. O. Box 9115, Akron, Ohio 44305. Send label or other evidence of purchase with each entry.
3. \$100 awards limited to one for each contest. Individual contests run in April, May, June, September, October, 1966. Entries must be postmarked by the last day of the contest in which you enter. All entries become property of The Goodyear Tire & Rubber Company and are not returnable.
4. Entries will be judged by Goodyear and the decisions of Goodyear will be final relating to questions about the contest and winners.
5. Contest open to everyone in the U. S. and possessions and Canada, except employees of Goodyear, the distributors of Pliobond adhesives and their immediate families. Contest subject to Federal and State Local Regulations.
6. All winners will be notified no later than November, 1966. List of winners will be sent on request enclosing self-addressed stamped envelope.

GOODYEAR

NEWS FROM THE
MILITARY
 BY WILLIAM R. KREH

Deflatable aircraft tires that will go flat on purpose are being designed by the Air Force. They are expandable sidewall folding tires which will deflate after take-off and inflate before the aircraft lands, requiring less storage space when retracted in flight. Air pressure from the aircraft's engine will be bled off to reinflate the tires before landing.

Blimp blankets. A year's supply of tarpaulins was made from a surplus Navy blimp envelope at the Long Beach (Calif.) Naval Supply Center, thus saving around \$6000. The covers, for outdoor-stored items, are waterproof, making them better than canvas which seeps some moisture.

Bandanas are back in style in the Army—at least in Vietnam. GIs there are being equipped with 36-inch-square "sweat cloths." They may be worn on the back of the head as a sun shield, tied around the neck, or used as large handkerchief.

A sea lion by the name of Peabody is working for Navy scientists at the San Francisco Naval Shipyard. The year-old mammal is being used by physiologists to study certain phenomena peculiar to his breed—the ability to make dives into the ocean's depths and automatically adjust to the changes in pressure by slowing down his body functions. Deep-sea dives are being simulated in a decompression chamber with Peabody as the diver. By observing and recording the reactions of the instrumented sea lion, scientists hope to learn what triggers his mechanism.

Watch those empties! A Vietcong officer was captured recently and among his equipment was a megaphone used to give orders to his troops. It was made entirely from empty beer cans that had been discarded by American GIs, with the name of an American brewer emblazoned on it.

A new device called "Readymaids," an Army "computerized mechanic," can determine malfunctions of certain wheeled vehicles in less than five minutes. It detects faults, types out cause descriptions, and lists required parts by number and repair-manual reference. ★★

<p>CHECK RUST & CORROSION <input checked="" type="checkbox"/></p> <p>around your house . . .</p>	 <p><input type="checkbox"/> CHECK YOUR GUTTERS AND DRAINPIPES</p>	 <p><input type="checkbox"/> CHECK YOUR GARAGE</p>
 <p><input type="checkbox"/> CHECK YOUR GARDEN TOOLS</p>	 <p><input type="checkbox"/> CHECK YOUR LAWN FURNITURE</p>	 <p><input type="checkbox"/> CHECK YOUR FENCES AND RAILINGS</p>

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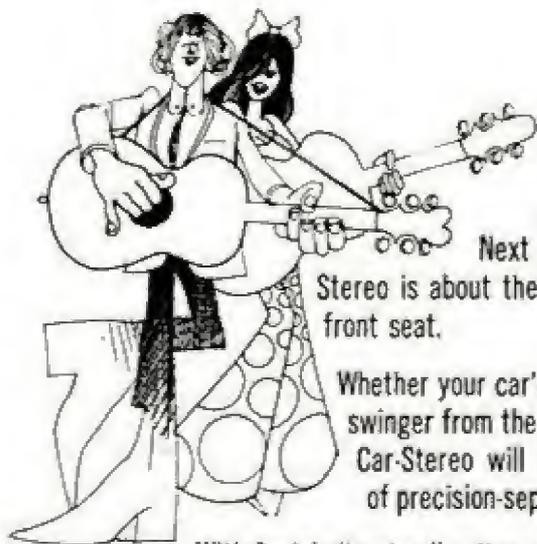
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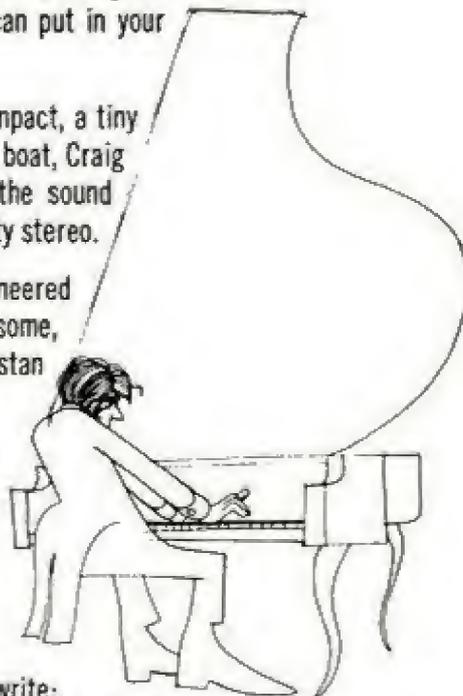
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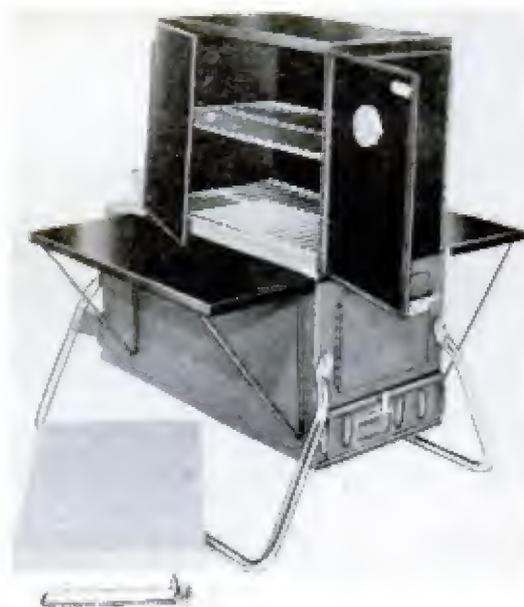
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Bronco wins at Riverside!

In the brutal Four Wheel Drive Grand Prix at Riverside, California, March 4-6, Bronco won top honors against all comers! Bronco 289-cu. in. stock V-8 won first in its class, while Bronco with a standard Six took Top Eliminator prize.

New
fun one
from **Ford**

HOMEOWNERS' CLINIC

BY W. CLYDE LAMMEY

Cesspool or Septic Tank?

I'm curious. Just what is the difference between a cesspool and a septic tank? I am currently building a house in a rural area that will require setting up my own sewage disposal system. I've been told a cesspool is a simpler, less expensive installation, but that it is less efficient than a septic tank.—G.T., Mont.

Put in a septic tank. It'll cost more, but it's worth it. Here's why:

A cesspool is nothing more than a stone-lined hole in the ground. Sewage enters it through a pipe from the house. Liquid sewage seeps away into the ground, while the solid matter accumulates and putrefies in the bottom of the cesspool. Unlike a septic tank—which digests and liquefies much of the solid sewage so that it can flow away into a drainage field—a cesspool merely collects it. As a result, cesspools are "dirtier" and have to be cleaned more frequently than septic tanks.

Repairing Rotten Columns

The bottom part of the 4x4-in. columns supporting our porch roof are pretty rotten. This rot extends almost to the top of the trim around their bases. Is it possible to repair them or will I have to put in all new columns?—N.K., Ala.

These columns can be repaired. Repair one column at a time so that the others will continue to support the roof.

Rip off the base trim, then force a length of 2x4 between the porch ceiling and the floor to serve as a temporary support. Saw the rotten portion of the column off square, then sand and paint the floor under the column. Replace the rotted section of column with a new piece of 4x4 set on four metal studs to permit air to circulate under it. Toenail the new piece to the main section of column, then paint it. Also, paint the backs of the new pieces of trim before nailing them around the base of the column, and cut shallow arches in the bottom of the trim to permit air circulation under the columns.

Holy Linoleum!

A number of small holes have been worn into the linoleum on our kitchen floor. Is there any technique for patching

(Please turn to page 18)

Test your automotive I.Q.



The tool in use here is _____ ?



What does this symbol stand for?

A torque wrench, which helps a mechanic apply equal pressure to head bolts. The life preserver is the symbol of Quaker State Motor Oil. Quaker State is refined only from 100% Pure Pennsylvania Grade Crude Oil. It keeps your car on the road, out of the repair shop . . . saves you trouble and money. That's why it's the finest engine life preserver you can buy. Quaker State your car —to keep it running young!



Quaker State Oil Refining Corporation
Oil City, Pennsylvania

HOMEOWNERS' CLINIC

(Continued from page 17)

these holes that will not ruin the overall appearance of the linoleum?—T.S., Calif.

Try this. Use some fine steel wool to smooth the edges of the holes. Then crush a small piece of matching linoleum into a fine powder. Mix this with some spar varnish to make a paste. Force the paste into the hole and smooth it with a putty knife so it is flush with the surrounding linoleum. When the patch dries, sand it with very fine sandpaper. Then wax it.

Ogre in the Basement?

I'm getting an awful lot of rumbling noises from my hot-water tank these days. Sounds like an ogre's in the basement. The pipes between the heater and the hot-water tank are perfectly level, so I don't think they're at fault. Also, the tank is never heated over 130°, so I don't think the rumbling is due to excess steam in the tank. What the heck can it be?—T.C., Wis.

You've identified the problem without recognizing it. It's those "perfectly level" pipes between the heater and the hot-

water tank. These pipes should slope upward to permit the steam generated by the heating coil to move easily into the tank. Otherwise the water in the line will tend to block the steam, source of the rumbling noise. Reposition the pipes as described and that "ogre" will disappear.

How to Prime a Dragon

Last winter we moved into an old house that has a lovely fireplace in the dining room. We use the fireplace regularly, but have dubbed it "The Reluctant Dragon" because it always puffs smoke out into the room when we first light it. After a few minutes it begins to draw and doesn't give us any more trouble until the next time it's kindled. Do you know how to make our "dragon" behave?—Mrs. P.Y., N.Y.

All that dragon needs, Mrs. Y., is a little priming in the flame-throwing department. Before kindling it next time, throw a few sheets of crumpled newspaper onto the grate and light 'em. The fast, smokeless flame they give off will warm the flue—and a preheated flue creates a much better draft than a cold one. This is what that old dragon was trying to tell you all along.

**Why does Mapleton
use two aromatics
when one would do?**

**For smoothness, man.
Smoothness.**

Maple and rare rum—what a combination! Mapleton has just the right amount of each to smooth out the smoke as no single aromatic can. Some aromatic tobaccos taste too sweet... can't smoke smooth. But Mapleton Smoking Mixture mellows the rich full flavor of aged tobacco—for smoothness, man.



United States Tobacco Company

Get Set for Faster and Easier Movies



NOTHING COULD BE SIMPLER than using the new Fujichrome film cartridge, the unique hub of a home-movie system introduced to the United States this spring. Merely plop the extra-thin cartridge in the camera and you automatically set the film speed for shooting 50 continuous feet without stopping. You can even reverse the film for trick effects.

A product of Fuji Photo Film Co. and Ehrenreich Photo-Optical Industries, this Single 8 film (Fuji's name for the Super 8 format) has a strong, thin, stable polyester base and is mounted in a two-spools-in-line cartridge. Unlike other cartridges, this one has no gate; it uses a gate in the camera to insure that the film always lies in the proper optical plane. A rubber roller in the cartridge permits rewinding for lap dissolves and other professional tricks. Other makes of cartridges are not now reversible. Worldwide processing facilities have been established for the film.

This simplicity of design assures more jam-free operation and provides a cartridge that is only ½-in. thick, making possible the exceptionally thin Fujica P-1 camera, pictured at left above.

To make use of the concept, Fuji has launched the P-1, a lightweight, fixed-focus unit with automatic exposure control, and the zoom reflex model shown above. Rounding out the line are two projectors, one of them for sound.

Interest in the system has spread. Honeywell, Inc., already has a camera that can be adapted to Single 8. ★★★



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DETROIT

LISTENING POST

BY JIM DUNNE

Create its own high-speed bank in a flat curve? Your car may one day be able to do just that. Dr. Yao T. Li, professor of aeronautics at Massachusetts Institute of Technology, has developed a suspension system that theoretically will produce the same effect on a car as a steeply banked track. Called "active roll mode suspension," Li's system leans a car's body into a curve rather than away from it. Key to operating the system is the force that puts a car in a skid. This "break-away" force is picked up by a "black box" and transmitted to a control device that mechanically leans the car in the opposite direction. The car automatically levels off as it comes out of a curve. Li says that because his system counteracts a car's tendency to roll over when cornering, softer suspensions for a more comfortable ride are possible. Also, he says greater vertical stability will make possible narrower body designs, thus reducing bulk and helping to solve certain aerodynamic problems (a wide, flat body at high speed tends to react like an airplane wing). Although Li's ideas have been proved on an experimental vehicle, they have yet to be tested on a racing car. If they work on a racetrack, there's the promise of higher speeds and obvious maneuvering advantages.

Spotlight on injuries, not accidents. In his sensational book, *Unsafe at Any Speed*, attorney Ralph Nader criticizes the U.S. auto industry for dragging its feet on safety advances. He says 75 percent of all auto injuries are caused by unsafe design. But what most people do not realize is that Nader is talking about causes of injuries, not causes of accidents. He concentrates on reducing the severity of so-called "second collisions"—what happens when passengers hit the interior of a car a split second after the initial impact. Safety experts agree permanent injury or death is too high a price to pay for a momentary unsafe driving lapse; they want cars built to protect passengers when an accident occurs, regardless of the reason for the accident. So, with its super-sensitive antenna extended and vibrating, look for Detroit to pay a lot more attention to making car interiors "survival capsules" as opposed to redesigning drastically such things as brakes, lights, tires, and so on.

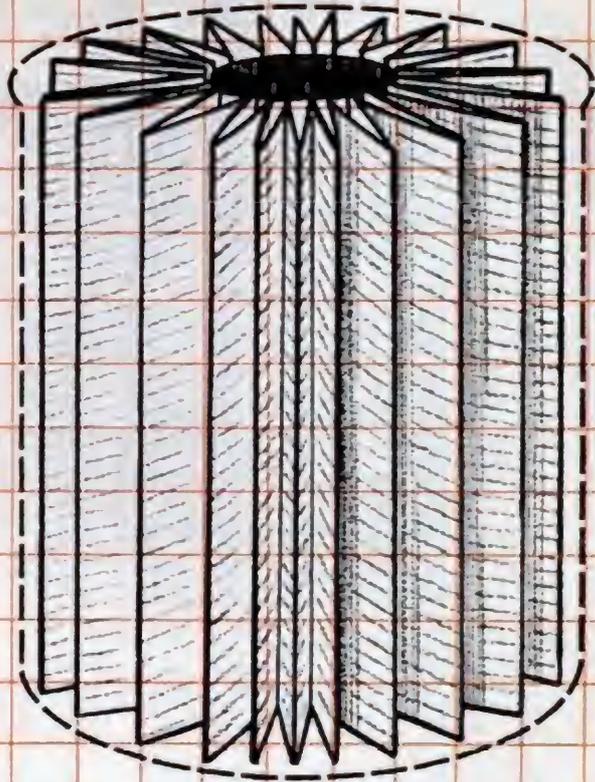
Swept-back dash panels are also in the safety works. The idea is to get all protrusions out of the way of front-seat passengers and the driver. The best way to accomplish this, engineers believe, is to move the whole dash forward as was done in the Toronado and Riviera. Experts say this type of arrangement will sweep the industry in the next two years. But there are certain problems involved. Heater ducts, for example, as well as wipers, airconditioning devices, radios, stereo tape units and glove compartments, must be changed to fit the narrower space between the new dash and fire wall. Either that or they'll have to be relocated inside the engine compartment. This is one reason General Motors and Ford are working on a hinged instrument panel—just not enough room to install instruments and wiring. And, the work space is shrinking.

Collapsible chassis frames and front sheet metal designed to absorb head-on impacts are being developed by Ford as another safety contribution for its regular passenger cars. Ford's goal is to reduce the impact of a 30 mph head-on collision to, say, that of a 6 mph collision. Most of the work now being done is concentrated on the front of the chassis frame. Frame extensions forward of the engine mounts will be weakened by using smaller members and by extensive use of "lightening" holes, like Swiss cheese. More "box" sections are being built into the sheet metal skin of cars to improve the sudden deceleration "cushion." But don't look for these developments before the 1968 models; production changes such as these just can't be made any sooner.

(Please turn to page 22)

From an AC Engineer's notebook:

AC's filter material contains millions of "dirt traps"



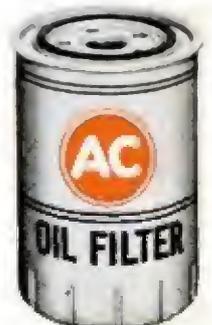
the AC Oil Filter removes dirt particles as small as 1/10th the diameter of a human hair and smaller



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AC SPARK PLUG DIVISION



DETROIT LISTENING POST

(Continued from page 20)

Your next new car may bear the imprint "Made in Canada." For almost a year the industry has been transferring production of certain models to Canadian assembly plants. The cars are then imported for sale to U.S. buyers. It's all part of a U.S.-Canadian trade agreement that calls for American car builders to bolster Canada's auto industry. As of now Chevrolet is planning to build 75,000 full-size models a year at a new assembly plant in Quebec, most of this production for sale in the New England area. Chrysler is already building Darts in Canada; Valiants, too. Ford is selling Canadian-built Galaxies in the Buffalo, N.Y., region. Many cars, however—Cadillac, Lincoln, Thunderbird, Imperial, Corvette and so on—apparently cannot be built economically in Canada. So auto-makers have upped Canadian production of the more common models to balance out the trade. The trend to "foreign" production will probably continue as long as the Canadian market keeps growing.

Chrysler will make a turbine car—if! The corporation says the two big road-blocks stopping production of a turbine

engine are acceleration lag and high fuel consumption. Beat these and the industry will be in the turbine business, period. Chrysler's next-generation turbine, already in the test stage, is expected to have these two problems under control. It will also have more horsepower than the 130 of present engines, about equal to the power of an existing 230 V8 piston engine. In a two-year test of turbine cars just completed, Chrysler said driver-testers liked best the cars' vibrationless ride at all operating speeds. Many mentioned a gliding sensation and said they felt fresh after long highway trips they thought would be wearisome in conventionally powered cars. Drivers also liked the lower maintenance requirements of the turbine, even though most did not drive it for long periods.

One-third of the drivers complained about acceleration lag, especially from a standing start. Chrysler says it has cut this lag to under two seconds in present engines. But it still has a long way to go before it can match the 0.4-second lag of most piston engines. Twenty-five percent of the testers were dissatisfied with mpg.

Chrysler did not release mileage figures, but it is known that proving-ground tests average 15 mpg under all operating conditions. ★★★

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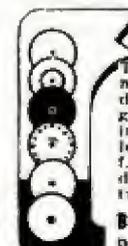
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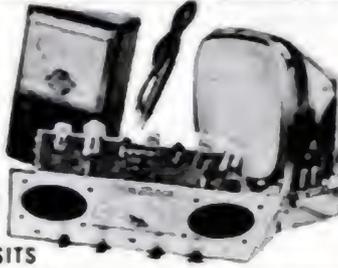
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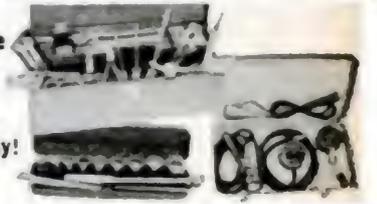
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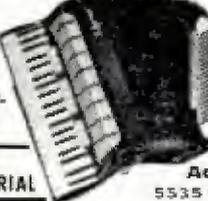
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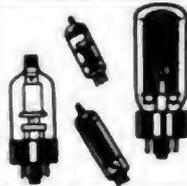
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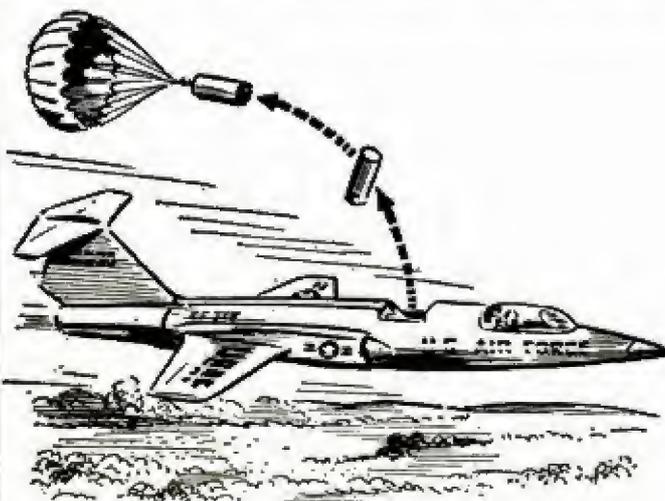


BY KEVIN V. BROWN AVIATION JETSTREAM

Bombs up! The Air Force is testing a system of ejecting bombs upward instead of downward so its low-flying jets can destroy targets without destroying themselves. The jets fly low so they are exposed to enemy ground fire for shorter periods of time.

Preliminary studies show upward ejection increases bombing accuracy and provides more time for the jet to escape the bomb blast. Either conventional or nuclear weapons could be used.

The system is similar to the pilot's ejection seat. The bomb is on a platform connected to two vertical parallel cylinders. Gas generated by propellant cartridges is



BOMBING UP allows pilot to escape before the blast

transmitted to pistons in the cylinders, accelerating the platform. It's designed to throw a 340-pound mass to a velocity of 100 f.p.s. with an 18-inch stroke.

An experimental model has already undergone static tests successfully, and a series of dynamic tests on a high-speed sled track at Holloman Air Force Base, N.M., this year. The runs will be made at various speeds up to twice the speed of sound. A dummy bomb will be ejected, simulating delivery by an aircraft. It will be set to rise about 150 feet above the sled track while cameras and scientific instruments record its behavior during flight. Flight tests may follow.

Low-level bombing is one of the most hazardous, but most efficient, of combat operations. Selected targets can be hit with pinpoint accuracy, but because of the proximity of enemy ground fire the pilots are placing themselves in the most vulnerable positions. ★ ★ ★

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Take a seat in this '66 Ford-built convertible. Look behind you and you'll see one reason why people have come to expect the new ideas from Ford. The rear window in Fairlane, Comet, Ford, Mercury and Lincoln Continental convertibles is clear glass: a Ford *innovation*. Introduced in 1964, all-glass convertible rear windows won't yellow, wrinkle or rip and resist scratching. What's more, you don't have to unzip them to enjoy top-down travel. Made of special tempered glass, they *bend* as you lower the top. And because they're pliant (actually can take a 45° twist) these windows withstand shock and strain that would crack ordinary glass!

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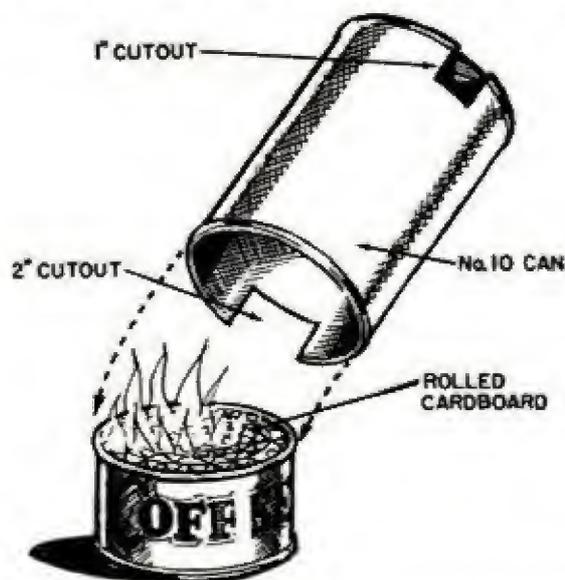
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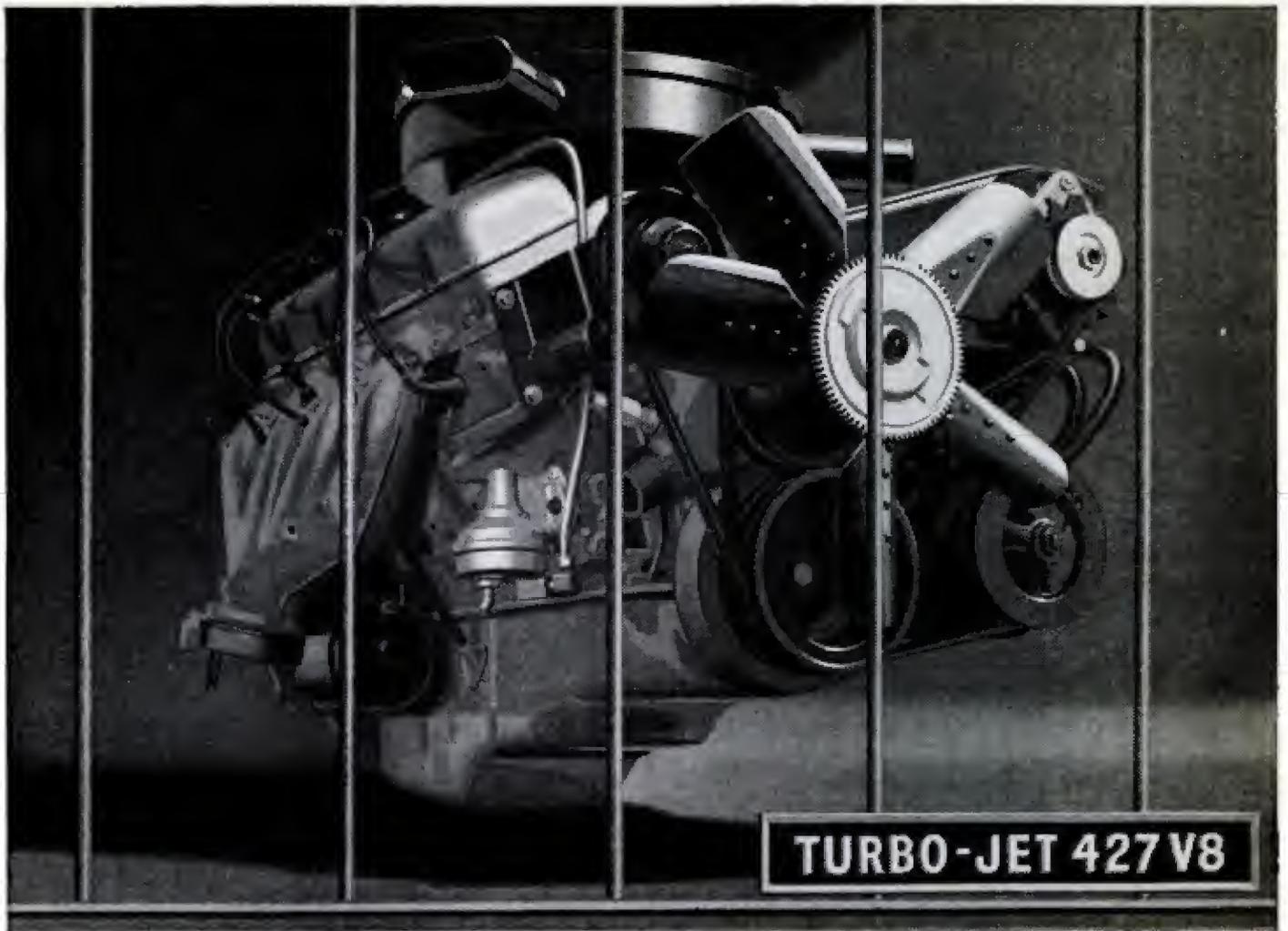
Candle stubs, cardboard and a couple of cans make an efficient one-burner campstove, writes Roger Kimble of Princeton, W.Va. A strip of corrugated cardboard about two feet long and as wide as the depth of a coffee can is coated with the melted wax from the candles. The cardboard is then rolled into a tight coil and fitted into an empty coffee can. Next, you take a No. 10 can and cut out a two-inch square on the side at the open end and a one-inch square in the opposite side at the top. The waxed cardboard is lighted and the No. 10 can is placed over the coffee



can, the two holes allowing a circulation of air. Cooking utensil is placed on top.

Sport parachuting accidents have been the subject of a lengthy study by the University of Wisconsin, and researchers have learned that one-third of the parachuting fatalities have been caused by drowning. Citing the major cause of death for skydivers, their report reads: "Unexplained are the parachutists who apparently make no effort to pull the ripcord." And you hardly ever get a second chance.

Annual bash for the Explorer's Club in New York featured the food delicacies of various cultures around the world, such mouth-watering delights as lambs' eyes, and unborn chicken removed from the egg five days before hatching, cooked and eaten—feathers and all. "I was stopped by an eskimo dish," one member explained. "It is best described as a sort of bacon rind that has been marinated in castor oil and seasoned with rancid seal blubber."



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BY CREIGHTON PEET

MAYBE THE THOUGHT of sitting at a desk and shuffling papers all day leaves you cold? Perhaps big-city smog and tensed-up decision-making are not for you? Well then, how about forestry—if you like fresh air and a rugged outdoor life and appreciate growing things? Forestry is a responsible job in which you are on your own much of the time and it has a special status. In your area you're an authority; people look up to you.

Forestry isn't a big-money career. You start around \$5,000 and can move up to \$13,000 or more. You need a college degree—an ordinary B.S. will do, but even though there are 25 accredited colleges of forestry in the United States graduating some 1500 men a year, there are still more jobs available than men to fill them. Of the nation's 17,000 professional foresters, 5000 are in the U.S. Forest Service, many are in other Federal jobs and the remainder work for state forestry departments or private forest industries.

Some best paying forestry jobs are with paper manufacturers, many of whom own immense tracts on which they harvest trees selectively, as a crop destined for their mills. They rely on foresters to keep their forests in shape, but most of their jobs require advanced technical degrees.

To start a forestry career, experts suggest you spend one or more summers with some forestry organization—Federal or industrial—during your college term. This will help you decide whether this is the life for you. Don't get the idea that a forester spends his time hunting, fishing and camping—for fun. He may spend days and weeks on the trail—on horseback, snowshoes or just walking—and some tours of duty are rugged, lonely and dangerous. An important duty is to watch for and supervise the fighting of forest fires—there's a story in the service of the forest ranger who, finding himself trapped by converging fires, quickly dug a hole and buried

(Please turn to page 34)

JOB TITLE	CURRENT NATIONAL		STATES WITH HIGHEST DEMAND				
	DEMAND	3-MONTH TREND					
Chemists, Biological	19	Demand steady	N.J. 3	Pa. 1	Ohio 3	Wis. 3	Calif. 2
Chemists, Organic	61	Very good increase	R.I. 4	N.J. 11	Pa. 7	Ala. 11	Ohio 7
Chemists, Inorganic	10	Some decline	Conn. 1	Md. 1	Pa. 3	Mo. 1	Tex. 1
Engineers, Metall.	72	Some increase	N.J. 16	D.C. 8	Pa. 7	Ga. 6	Wis. 5
Engineers, Civil	564	Very good increase	D.C. 67	N.C. 28	Fla. 27	Ohio 93	Calif. 80
Engrs. Elect. & Electron.	1037	Some increase	N.Y. 101	D.C. 52	Fla. 126	Ohio 38	Calif. 218
Engineers, Industrial	564	Very good increase	N.Y. 40	Pa. 42	Fla. 44	Ohio 66	Calif. 81
Engineers, Mechanical	1534	Tremendous increase	N.J. 83	Fla. 116	Ohio 153	Calif. 300	Wash. 86
Engineers, Aero.	572	Substantial increase	Pa. 71	Ohio 45	Mo. 60	Calif. 244	Wash. 120
Engineers, Mining	15	Some increase	D.C. 4	Kan. 1	N.M. 2	Ariz. 3	Calif. 2
Natural Scientists	162	Good increase	N.J. 20	D.C. 31	Pa. 11	Tex. 9	Wash. 53
Draftsmen, Architectural	90	Some decline	N.Y. 9	Fla. 8	Mich. 6	Calif. 16	Wash. 11
Draftsmen, Electrical	276	Demand doubled	N.J. 28	N.C. 20	Pa. 28	Mo. 20	Calif. 132
Draftsmen, Mechanical	475	Very good increase	Pa. 63	Ohio 49	Wis. 62	Calif. 44	Wash. 61
Draftsmen, all other	413	Very good increase	Conn. 26	Pa. 39	Mo. 53	Calif. 103	Wash. 38
Tool Designers	245	Very big increase	Ga. 50	Ill. 17	Kan. 50	Calif. 52	Wash. 30
Lab. Tech. & Assistants	122	Some increase	N.Y. 21	Ga. 11	Ind. 9	Tex. 9	Wash. 8
Sports Instr. & Officials	46	Big drop	Conn. 2	N.Y. 7	Md. 3	Iowa 2	Calif. 12
Surveyors	14	Some decline	N.C. 2	Ala. 1	Ill. 3	Ark. 1	Mont. 1
Techs. Eng'g & Phys. Sci.	726	Very good increase	Ala. 187	Fla. 52	Ohio 68	Calif. 105	Wash. 182
Tool Planners	99	Demand tripled	Ga. 50	Ohio 22	Ind. 7	Kan. 20	
Systems Engineers	41	Demand doubled	N.Y. 4	Pa. 2	Kan. 10	Mo. 21	Neb. 1
Programmers	303	Some decline	D.C. 17	Va. 12	Ohio 25	Calif. 88	Wash. 81
Systems Analysts	54	Some decline	N.Y. 5	D.C. 12	Ohio 4	Calif. 15	Wash. 8
Inspectors Pub. Service	13	Good increase	Wis. 3	Tex. 2	Calif. 1	Nev. 1	Wash. 6

PM's Career Barometer Chart, above, gives the actual number of men currently needed for specific jobs. "Current Demand" figures are true as of our closing date. Check this chart each month and it will tell you where your talents are needed, and how badly. For names of actual employers represented by these listings, contact the state employment agency in the capi-

tal city of the state indicated. Mention that you saw this in **POPULAR MECHANICS**.

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CAREER BAROMETER

(Continued from page 32)

himself until the fire had passed.

The young forester may find his headquarters shifted frequently at first but eventually he is assigned to a small, pleasant town. After earning advancement he will get a more permanent headquarters in a larger city. Permanent forest ranger jobs are under Civil Service.

Because of his specialized knowledge, a forester is often consulted by farmers, cattlemen, lumbermen, lumber mill owners, pulp mill operators and bankers, so that he sometimes acts as a teacher. It is thus essential that he have a good command of English. At times he may be asked to lecture at schools.

After a few years, a forester usually becomes an administrator who plans and supervises forest management, with perhaps a quarter-million acres under his care. His work is quite varied. At one time he may do a winter check of the elk living in a national forest—a job done on snowshoes. In a different season he may cover breeder pine cones with canvas bags to keep the squirrels away.

With a constantly growing population, more campsites are being built in national forests and in many private forests open to the public on a limited basis. The forester supervises the building of shelters, fireplaces, simple chairs and tables; also works with engineers on larger projects. His care of the timber and watershed is essential. Water flowing from his forests feeds streams which feed rivers which quench big city thirsts.

In remote areas the forester is an invaluable contact with the outside world. He brings in word of new methods and equipment, and offers suggestions on how a man can make his land more productive.

When a college graduate starts to work for the U.S. Forest Service, he is assigned to one of several ranger activities: range administration, wildlife management, recreation, timber stand management and watershed protection.

Unquestionably, many most profitable forestry jobs are with pulp and paper firms, and they provoke an argument as to just what forestry is. Some companies say a forester follows a log right through the plant until it's turned into a baseball bat or, maybe, the very page you're reading now. Not much outdoor life involved. But when you get that top job in a paper mill, it may be worth \$20,000.

For information on accredited schools and colleges of forestry, write to American Society of Foresters, 1010 16th St. N.W., Washington, D.C. 20036.

EDITOR'S PAGE

PM's mailbag adds up to about 100,000 letters a year. That's what Sophie Gronowicz (below) tells us, and Sophie should know. She runs our Information Bureau, which opens and responds to them all—with occasional help from an editor. The letters come from you readers, all over the world. What's in them? Recently a reader wanted to find a "new" kind of battery that appeared in our May, 1956 issue (he was steered to the source). King Michael of Roumania wrote in last summer asking for an "arogah horn" he'd seen in an old issue—the kind, he said, on his family's 1924-'28 Lincolns (We found one for him).



And last month, a reader filled in and returned a survey card bound into our May, 1930 issue (he's Henry Morehead of Los Angeles, an engineer, 50 years old, a *PM* reader since 1926, has a home workshop, likes to make replacement parts for old cars.) Obviously, he has a sense of humor. Mostly, this mail storm carries urgent requests for plans we've run; information on items we've carried; help on projects we've sponsored. More than a third of it gets a personal reply from Sophie or her three girls. If you've been among the recipients, thank Sophie. She found your answer.

Craig Breedlove, holder of the world land speed record (600.01 mph) with his famous "Spirit of America" jet car, was in New York for the auto show and some of us had dinner with him. He regaled us with tales of his early troubles—how, penniless, he moved his half-finished monster into his dad's garage, and finally the house (dad and mom moved out to escape the racket, and the machinery moved in); how he made his first bid for sponsorship by marching into the office of Shell's western

manager "in a clean pair of levis and a sport shirt," with the model car under his arm. The man knew another Breedlove, and thought it was *him*. But the five minutes Craig was allowed became an all-day session, and wound up with backing. This is a remarkable young man with a remarkable drive and determination to win. He hums with ideas about automobiles and what he hopes to do about them. You'll read about some of them in a future issue.

Unidentified flying objects have been sighted all over the place lately. Some reports came from Los Angeles in March, where witnesses saw glowing fireballs and objects with colored lights in the night sky. For once, witnesses were right. The "objects" had been launched by a pair of Caltech's practical jokers. They had rigged polyethylene balloons with flares in a hidden steam tunnel, and sent them soaring. Author Joe Bell warned you about those geniuses in our March issue. They're still at it. Incidentally, a reader of that article, Hjalmar Schuetze, called to tell us that in his copy, the last page of the story had been removed. He wanted to know if the missing page was a Caltech trick. Who knows?

Fred Duesenberg, whose dream car reincarnation of his father's famous automobile was featured on *PM's* cover in January, brought his dream to reality. His new Duesenberg now exists. The first produc-



tion prototype (above), was displayed at Indianapolis last March, where its predecessors won the "500" in '24, '25 and '27. Like it? \$19,500.

R. F. Duesenberg

Spotlight on the

MGB—GT

Sporty 'two-seater' for the man with a small family

By ALEX MARKOVICH

DRIVING A SPORTS CAR used to be like flagpole sitting or marathon jitterbugging. You did it to see how much punishment you could take. Then those new civilized sports cars spoiled all the fun with their draft-free roll-up windows, good heaters and generous luggage space.

Yes, it was bound to happen. They've finally turned the MGB roadster into a family man's car (albeit, a *small* family).

The new MGB-GT is basically the two-seater with a fashionable fastback roof permanently tacked on. British Motor Corp. also added a rear luggage platform, a children's jump seat whose back folds flat and a rear door that hinges upward like a station wagon tailgate.

Climbing into the car is tricky because of the low roofline and narrow-opening doors. But once you get in, you find the accommodations comfortable (at least in the front seats). Headroom is adequate, legroom excellent. Seats offer a wide adjustment range, but the lever is a bit stiff. Rake of the seatbacks can be changed with a wrench.

Seating position is low enough to make a driver of average height feel uncomfortable at first. But visibility is good except for the rear-view mirror that gives a better view of the road surface than of the cars behind.

With headroom and legroom in back minimal, the jump seat accommodates only a couple of 5-year-olds or a single adult, preferably one you don't especially like.

The neat dash houses a prominent tachometer and speedometer as well as gauges for oil pressure, water temperature and fuel level. A warning light monitors amps. The dash has a glare-free black finish, but the chromed ashtray on the floor tunnel and the frame around the shift lever can be annoying.

The steering wheel is farther from the driver than in most British sports cars, but still too close for arms-out driving. Perhaps that's just as well, because the steering, though precise, is fairly heavy, even at speed.

The engine starts willingly, but requires full choke for a couple of miles, even in mild weather. The gearshift lever is well-placed and its travel is crisp. BMC still hasn't synchronized low gear, but the three higher gears are crunchproof



except during really brutal speed-shifting.

At 2,030 pounds, the GT is slightly heavier than the roadster, but performance doesn't suffer—probably because of improved aerodynamics. The 110.5-cu.-in., 95-hp Four pushes the car from zero to 60 mph in 11.2 seconds. Passing speeds also are impressive—40-60 takes 5.1 seconds in second and third gears, and 50-70 takes 7.0 seconds in third gear only.

Under steady throttle over fairly level roads, our fuel-flow meter registered an awesome 32.26 mpg at 30 mph. Fuel consumption at 40 mph was 31.07; at 50 mph, 28.66; at 60 mph, 24.20; at 70 mph, 22.61. The speedometer was three mph fast at a true 30 and 40 and four mph fast at 50, 60 and 70.

The brakes (disc in front, drums in back) require more than average pedal pressure, but are fade-resistant.

Ride is firm and well-controlled, with a minimum of pitching. Handling is excellent, even better than in the MGB roadster. This is because an antisway bar, optional in the roadster, is standard in the GT. The only difficulty is rear-axle hop when cornering on a rough road, a characteristic of "live" rear axles.

The most welcome surprise was the quality of workmanship. Body panels fit perfectly, carpeting and upholstery have no rough edges or glue streaks, no rattles were apparent and in a heavy rainstorm not a drop found its way inside.

Interior luxury touches include a locking glovebox, a small storage box on the right kickpanel, and rear side windows that hinge out to extract air.

All in all, the MGB-GT is a bargain at \$3,095 (East Coast port of entry)—especially if you need that extra luggage and passenger space. ★★★



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BY MARION MOREY

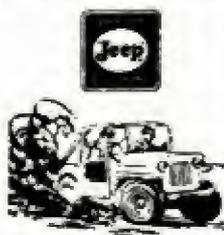
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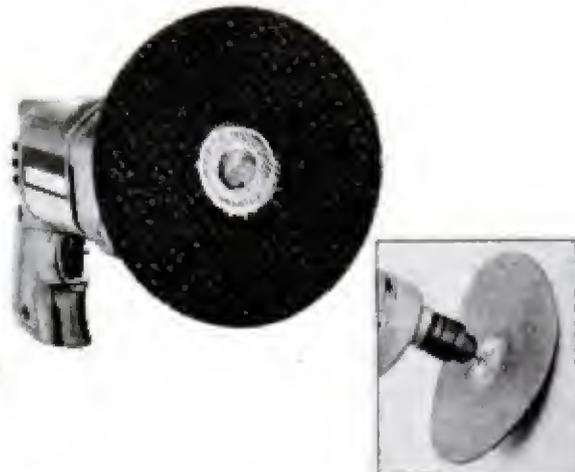


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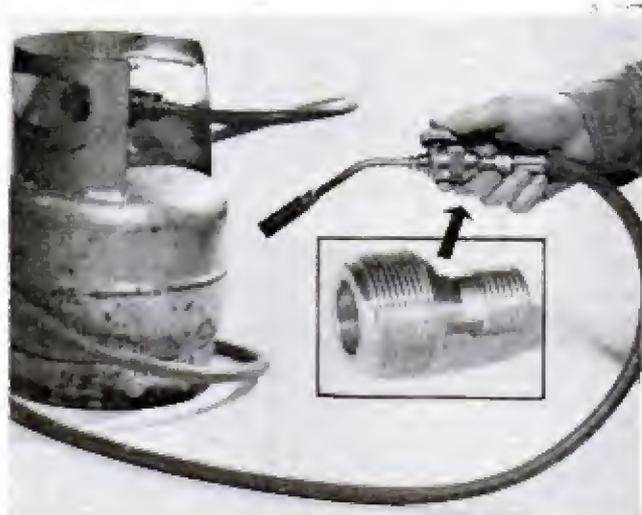
GENERAL ELECTRIC

SHOPPING FOR TOOLS

BY RICHARD HOWE



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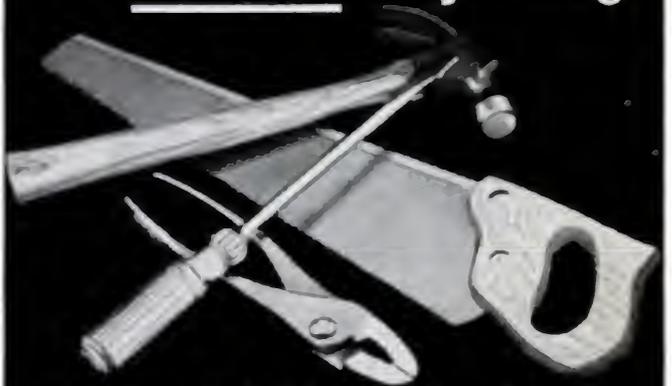


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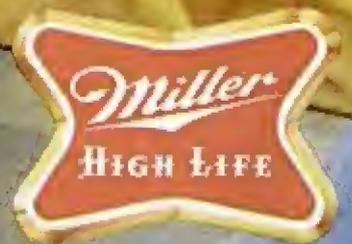
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SECRET SNAPSHOTS OF THE '67 CARS

PM's Detroit auto 'spy' exercises cunning and daring (to say nothing of risking his neck) to bring you sneak photos and preview facts of the industry's plans for the coming model year

By Jim Dunne
PM's Detroit Automotive Editor

THREE COMPLETELY NEW CARS and a dramatic styling movement toward softer, more rounded lines: they're set for star billing this fall when Detroit trots out its 1967 models with fond hopes of making you—the average guy—bug-eyed.

Sporty new models will reach new heights in fastback styling, while the more balanced long trunk will remain a characteristic of the big four-door sedans. The crisp, highly defined appearance in vogue two years ago will take a back seat.

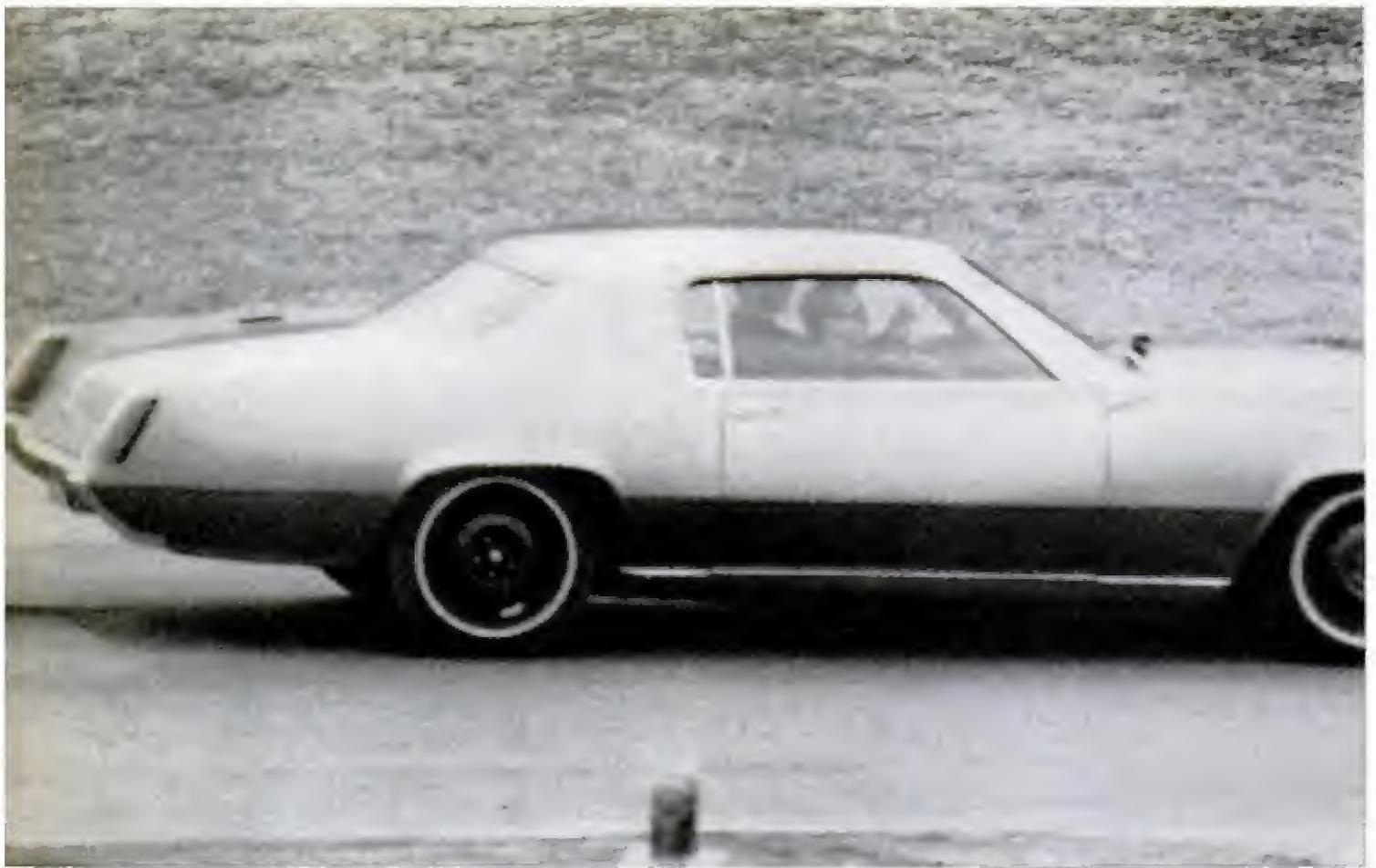
New and larger powerplants will fan the horsepower race. And, in frank recognition of a great ground swell of public opinion, you can count on the greatest influx ever of safety improvements.

Making their debut on the fall market are the greatly anticipated Panther from Chevrolet, Lincoln-Mercury's sporty little Cougar and the front-drive Cadillac, a luxurious hulk of comfort and precision. Late reports hint the two GM cars will have new names before fall introduction. But for now I'll call them Panther and Eldorado.

Panther will come in a two-door model and a convertible, a lot like the present Mustang. Wheelbase is set at 108 inches, the same as Mustang and Corvair. Seating will be the popular two-plus-two with center console and bucket seats, or a minimal three-plus-three with conventional bench seats front and rear. A special model with a sportier appearance and disappearing headlights is also set for fall unveiling.

With this car, Chevrolet will have three models—Chevy II, Corvair, Panther—of almost exactly the same size. Because of overlapping model offerings, especially in sportier versions, Chevy will drop some top-of-the-line Chevy IIs and Corvairs. Panthers will fill the gaps.

Panther obviously is aimed to compete directly with the sensationally successful Mustang. The one question auto buffs ask now is, "What took Chevy so long?" Ford has already sold well over one million Mustangs and will have a complete styling change for the '67s.



FRONT-DRIVE CADILLAC will debut this year. Dubbed "Eldorado," it reflects successful Toronado

The answer lies in the Corvair. Chevrolet saw the Mustang as a reaction to Corvair sales and thought the cars would be close competitors for years. But the little Ford skyrocketed past Corvair almost immediately. Now Chevrolet is hoping its Panther will stop the surge.

Panther will have all of Chevrolet's smaller power combinations to offer as options to the standard six-cylinder engine. Expect the V8 options to include the 327 cu.-in., 250-hp mill. The regular transmissions, three and four-speed manual and two-speed automatic, will be available. Look for the Panther price to be nearly identical with that of Mustang.

Cougar, another fall entry into the small, sporty car field, will be sold by Mercury dealers in one body style, a two-door hardtop. A sleek fastback will be added later in the model year. Cougar will have many of the Mustang components including engines, basic body, transmissions and options, but will be 3 inches longer in wheelbase for added rear-seat legroom.

Inside Cougar you'll find expensive trim touches making it even more attractive than the flashy Mustang interiors. The plan is to offer the car with V8 power only

for a basic price about \$150 above a stripped Mustang.

Eldorado, first front-drive car in the Cadillac Div., will be similar to the Olds Toronado in drive train design, passenger compartment dimensions and performance. There the likeness ends.

Cadillac is giving this car distinctively new styling even though the basic body is General Motors "E" type used by Toronado and Riviera. The front end will feature horizontally-placed, hidden headlights, and a waffle-textured grille framed by an overhanging hood and extended front fenders. Massive-looking, Eldorado will follow the current trend to semihermetically-sealed passenger compartments with flow-through ventilation systems and single-piece door windows. Bright trim will be tastefully limited on the outside. Rear-end styling will follow the conservative, long-deck design.

Like all other '67s, prices for the Eldorado will not be announced until next fall, but an educated guess places this Caddy in the \$7000 bracket with normal extra equipment. Look for it to be eminently successful right from the start, with a yearly sales goal of 20,000 to 30,000 units.



DESIGN OF 1967 FORDS will feature sheet-metal changes for cleaner lines



CHEVROLET FOR 1967 will continue graceful, semi-fastback line of present models, lengthen bodies

What the snapshots don't show . . .



MERCURY grille will feature severe overhang

OLDS re-creates former Cadillac hood bulge

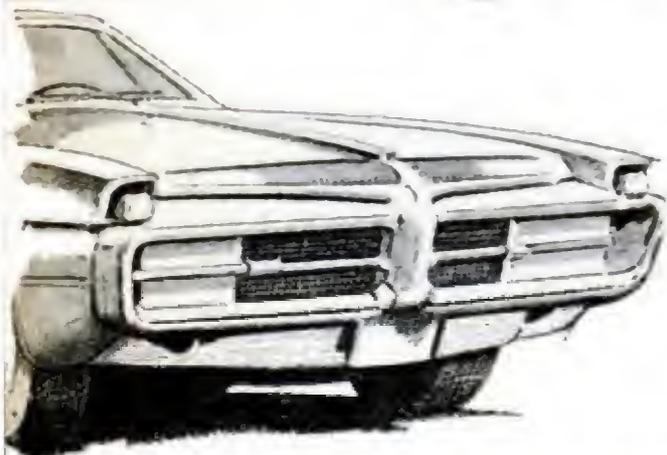


CHEVROLET displays clean, functional look aft



PANTHER is Chevy's long-awaited go-go entry

Drawings by Henry Comstock



PONTIAC may be overdoing it a bit up front . . .



. . . **BUT AFT** the lines are crisp, purposeful

PM

Differences between Toronado and Eldorado drive trains will be restricted mostly to universal joint design, differential ratios and valving in the transmission shift points—all made to accommodate the heavier weight of the new Cadillac and its 429-cu.-in. engine.

Thunderbird, Imperial and Barracuda will also undergo significant changes in 1967 versions.

Thunderbird will have two body styles for '67: a two-door hardtop and, for the first time, a four-door sedan. T-bird's convertible will be dropped for the time being, to be introduced later in the model year. Wheelbase will stretch at least four inches from the present 113 with the extra length going for back seat legroom. Unit body design will give way to a separate frame and body using a torque box perimeter frame design similar to the present Galaxies.

The big "sail" at the "C" pillar that has become a T-bird trademark will be retained; this makes the car easily recognizable in spite of extensive changes. On the two-door model, the small rear side window cranks back into the wide "C" pillar instead of straight down toward the wheel well when opened. Caddy's new Eldorado has the same type action. On the four-door model, both doors lock on the center "B" post a la Lincoln. Vent windows in the front doors have been dropped, adding to the sleekness of exterior styling. For rear styling, there's a severely chopped deck and a grille-like design on the back of the trunk lip which echoes the front-end look. Full-width taillights are retained.

Ford engineers have gone to extreme lengths to reduce the transmission hump

in the front floor by tipping up the front of the engine at a sharp angle. In one T-bird I saw, the engine appeared to be installed at about a 20° angle from the horizontal.

Barracuda will get extra attention from Plymouth this fall to make it more competitive with the "Mustang" group of vehicles. Fastback styling will continue on a single model bearing little resemblance to the regular Valiant line. Plymouth wants to separate Valiant and Barracuda as much as possible next year. Later in the model run, probably about January, Plymouth is expected to bring out a convertible in the Barracuda line.

Imperial will get the biggest change of all Chrysler Corp. cars for '67. And no matter how they explain it, the Imperial is being downgraded. The difference is in a smaller body shell. Imperial will discontinue its exclusive Chrysler Corp. use of separate body and frame construction and take on a modified version of the big Chrysler basic body using unit construction. Wheelbase, 129 inches now, will shrink somewhat but will not go all the way down to the 124 of the Chryslers. Modifications in the stub frame ahead of the main Chrysler body will enable Imperial to stretch wheelbase, get a longer automobile and come up with different styling proportions than the regular Chrysler line.

The new Imperial will benefit in several ways from the changes. It will take on a sound body design that has been improved over the years Chrysler has used it. It will cost less, too: the same tooling used for Chryslers is now shared with Imperial. And it will look more modern

(Please turn to page 200)



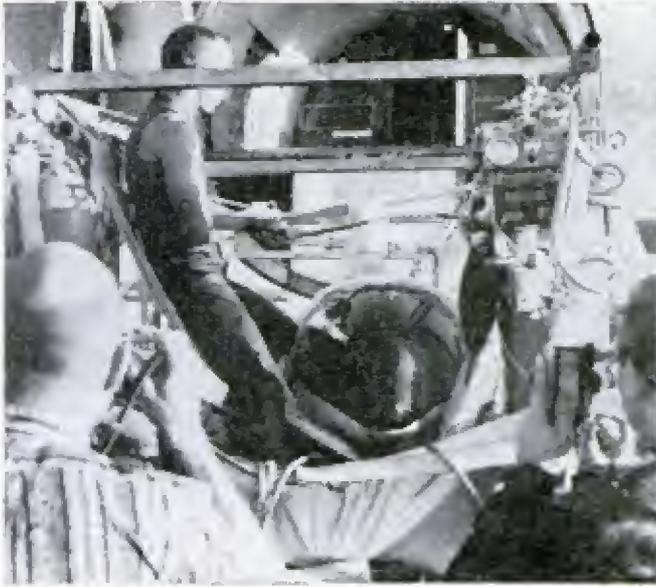
PONTIAC FOR 1967 retains basic '66 lines, but will introduce new grilles for Catalina, Grand Prix



Cool island in the sun is provided by this reinforced paperboard lounge which protects surf sirens and other sun worshippers from scorching sand. It can be elevated for tanning, laid out flat for picnics and games, and then folded up for easy toting and storage. The colorfully decorated lounges are marketed by Stickel Enterprises, Inc.



"Dirty Cars Wanted" is what the sign says. And with the help of an old milk truck, a used water tank, a small gasoline-driven a.c. generator—plus such things as cloths, soap and wax—Frank Milstin of Hollywood, Fla., conducts what is perhaps the only mobile auto bathing business in the world. His profit-making setup even includes a portable canopy to provide shade for waxing jobs.



First killer whale to fly, Shamu was transported from Puget Sound, Wash., to an aquarium in San Diego, Calif., by truck and plane, riding in a sheepskin-lined cradle. She let out a squeal of joy when lowered into the salt-water pool. Only one of two killer whales in captivity, the young female—she's thought to be 2 years old—is 14 feet long, weighs 2300 pounds and eats several hundred pounds of fish each day.



Strange structure is not a big bird cage but a 24-story plastic greenhouse for botanical research. It was erected in Leverkusen, Germany, near another imposing building of conventional design. The second structure isn't in danger of falling—it suffers only from camera-angle tilt.



Nylon shutters that eliminate painting and reduce maintenance are being offered with snap-on fasteners. Prefinished, the Du Pont shutters are said to be rotproof and impervious to weather exposure. The fasteners consist of aluminum straps and spring clips that remain hidden when the shutters are snapped into place. They are said to hold securely in high winds.

COVER STORY

Lawn Mule



It's a new concept in garden tractors—tricycle design with front-wheel drive for turn-on-a-dime maneuverability and a single control for throttle, brakes and steering.

By ART MIKESELL

SOMETHING REALLY NEW in lawn equipment doesn't come up every day, but a squat, little yard-long garden tractor called the "Lawn Mule" qualifies as big news on at least three counts.

- Just introduced by Technoid Corp., it's the first garden tractor ever offered in kit form. If you can handle a screwdriver and wrench, you can save \$125 of the \$450 suggested retail price by putting it together yourself. (For a detailed story on assembling the \$325 kit, see page 130).

- It has a novel configuration, but not just for the sake of novelty. It has but three wheels. Now, any tricycle-type vehicle normally has a much tighter turning radius than a four-wheeler, and with front-wheel drive that radius is even smaller.

The Mule, driven through its front wheel, is amazingly maneuverable—most welcome if your lawn is small or broken up with numerous beds. You can nose it right up to a wall, swing the front wheel around parallel with the wall and make a right-angle turn without backing up.

- The control system is another design departure. You direct all operations through a single "control bar"—actually a streamlined handlebar. Depress it and the Mule accelerates; release it and the Mule brakes automatically; swing it to one side and the Mule turns.

As garden tractors go, the Lawn Mule is something of a midget—about a yard long, 41½ inches wide (to fit a 42-inch door opening) and 34 inches high at the control bar. It weighs approximately 300 pounds; almost half being dead weight cast into the body to provide extra traction and stability.

Depending on the driver's weight, this puts the center of gravity at a low 16-to-20 inches above the ground near the center of the supporting triangle.

The heart of the Lawn Mule is that driven front wheel with engine above. Under the name, "Power Wheel," this unit has survived eight years of rugged industrial use as a drop-in power component for any materials-handling vehicle.

The engine, a 3½-hp, four-cycle Lawson with aluminum block and recoil starting, provides enough power for the Mule to tow up to 3500 pounds on level ground.

All tires are pneumatic—tubeless with automotive-type treads in the rear and a tube-type "knobby" mounted on the front,

IT'S A FOUR-HOUR KIT!

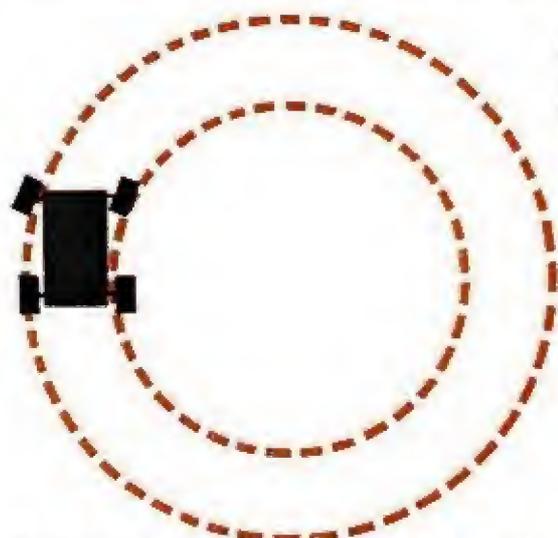


TURN TO PAGE 130 for a step-by-step story on assembling the Lawn Mule from a kit.

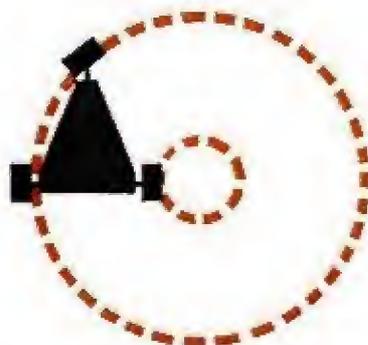
split wheel. If your lawn is extra soft, the manufacturer recommends the automotive tread for all wheels. One for the front is available at extra cost.

You may use the Mule with most standard towable lawn implements—spreaders, ganged reel mowers, rollers—but it's scheduled to have its own family of custom-matched accessories by the time you read this. A dumping trailer is now in production.

Present plans also include a 42-inch three-blade rotary mower (\$179) and a 42-inch snow blower (\$195)—push-type units powered by 3½-hp engines. ★★



Why you can spin the mule completely around in only twice its own length



TURNING RADIUS of a four-wheeled vehicle (left) is determined by how sharply you can cramp the front wheels. A three-wheeled rear-drive vehicle (center) will normally make a tighter turn because you can cramp that single front wheel more sharply. However, the rear wheels have to travel in order to propel it through the turn. With power delivered to the front wheel, the Lawn Mule (right) will turn without any forward motion



1.



Deadly booby traps in a dirty war

Many GIs are victims of an enemy they never see. They are impaled on razor-sharp 'punji' stakes, caught in leg-crushing 'tiger traps,' bitten by venomous snakes tethered in trees — even blown up by children with hidden bombs laced to their bodies

By EDWARD HYMOFF

VIETNAM IS A DIRTY WAR in more ways than one. You don't have to tell it to the Marines. They know.

The officer commanding the Third Battalion, Ninth Marine Regiment, had moved up with his outfit to what was left of a tiny village. A map clutched in one hand, Lt. Col. Robert Tunnell of Fallbrook, Calif., snapped orders to his staff. The wiry officer, a camouflaged helmet sitting atop his close-cropped head, was a savvy combat commander, with two wars behind him. He wasn't about to get caught by the Vietcong as he kept tabs on the



2.



3.



4.

battalion's patrols that were seeking out the elusive enemy guerrillas.

He glanced at his terrain map and then looked up, automatically taking a few steps forward to confer with one of his officers. The soft ground beneath the leatherneck commander suddenly erupted in a geyser of black earth,

1. Spearlike punji stake being examined by crewmen ripped through helicopter on making landing

2. Night setdown on this "spiked" field near Da-nang could have been nightmare for U.S. choppers

3. Spike trap, normally hidden by grass cover, snaps together on leg above protective GI boots

4. Instructor rigs tree with mace. Weighted, it's designed to slam into chest of oncoming soldier



VIETCONG CROSSBOWS are aimed along jungle paths. They're triggered by cleverly concealed trip lines



PRIMITIVE SPRING WHIP, with spikes at its business end, is used in stateside demonstration course



TRIPPED BY WIRE, rakelike "Malaysian gate" slams forward, plunging wicked bamboo stakes into victim



DEADLY BAMBOO VIPERS such as this specimen are used by Vietcong to booby-trap caves and tunnels



LATTICEWORK AND DIRT hide lethal "punji pits" along trails. This "cutaway" version is training device

grass and smoke. Col. Tunnell was lifted up by the blast. His body slammed to the ground a few yards away.

"Corpsman!" cried Sgt. Adolf Hartschlag, the closest man to the CO, as he ran toward the crumpled body. Another explosion erupted, this time beneath the sergeant.

Marines suddenly froze where they stood. One shouted: "Booby trap!" Those who began moving about the area gingerly lifted one foot and then set it down lightly before thrusting the other foot forward. The area was mined. One-pound blocks of TNT armed with homemade pressure fuses were dug up as men probed the soft ground with wood or metal rods. It took time for the medical corpsmen to reach the badly mutilated victims. Col. Tunnell had lost his right leg. Sgt. Hartschlag, his left.

The elusive communist guerrillas hadn't fired a shot. In fact, until United States military forces in Vietnam went into action on a large scale, at least 60 percent of all casualties were caused by ingenious homemade weapons in what one ordnance officer has called "this booby-trap war."

In Vietnam today the art of booby-trapping has reached a diversity that is frightening. Some of the sudden-death weapons are startling in their simplicity; others are surprisingly complex. Simple or complex, however, they are effective.

Many of the simpler traps are based on the *punji* stake, which is no more than a length of bamboo with a sharpened end that sometimes is fire-hardened. But for all its primitiveness, it's capable of doing tremendous damage, as our soldiers first found out back in the days when they served merely as military advisers.

Major has close call

Maj. Patrick Delevan, an Army helicopter pilot who was awarded the Distinguished Service Cross for a series of adventures in Vietnam in which he was shot down nine times and wounded five times, received one of the clusters to his Purple Heart when he fell into a trap.

In an effort to evade Vietcong snipers who were firing at his downed helicopter, he crawled through the grass lugging his trusty shotgun and tumbled into a camouflaged ditch that was studded with bamboo stakes sharpened to a deadly point. Fortunately, he fell between the stakes, though one pierced his arm. He was res-

cued a short time later and rushed to medical treatment because of the danger of infection. The Vietcong smear their punji stakes with human excrement which, after a few days, turns into a fast-acting poison. Luckily for the balding aviator, the trap was an old one and the poison that was smeared on the points of the stakes had long since dried up and lost effectiveness.

All-purpose weapon

As more helicopters began to come into use, the guerrillas used punji stakes for other purposes. Large ones were hidden in the tall elephant grass of possible landing zones and time and again helicopters were disabled when stakes pierced vital fuel tanks or fuel lines. Of course, the classic use of the stakes by the Vietcong was to line the sides of trails with them and then spring an ambush. Soldiers would dive into the underbrush to escape the enemy's fire and impale themselves.

It's a Vietcong axiom that if you can knock out one American soldier at least four others will have to go to his aid. That means that anywhere from two to five men are taken out of action just to care for one casualty. What better way to rack up casualties and tie down fighting men than with simple weapons like pieces of board with nails hammered through them? The boards are buried in the ground with the points of the nails probing up through the grass. Many Americans were knocked out of action by this trap as they stepped on nails that pierced the relatively soft leather soles of their boots and caused painful injuries. The U.S. Army countered by ordering a new type of combat boot with a steel plate for an inner sole. At least this was one antidote to this type of booby trap.

It didn't take long for the Vietcong to come up with an effective counterweapon, an antipersonnel bullet mine. A 30-cal. bullet is held upright by four nails hammered into a flat piece of wood. A fifth nail, hammered in from the other side of the board with its point resting beneath the base of the cartridge, serves as a striker. The pressure of a foot on the bullet shoves it against the striker which, in turn, fires the cartridge. No steel plate in a boot can stop this simple weapon.

Ingenuity is an integral part of guerrilla warfare and the Vietcong have come

(Please turn to page 210)

1966 Coronet owners report: Great handling, indifferent workmanship



By BILL KILPATRICK, *PM's* New York Automotive Editor

SOMEWHERE IN MASSACHUSETTS there's a cool, calm iceman who claims his 1966 Dodge Coronet is the best handling car he has ever owned. And out in Southern California there's a hot-under-the-collar engineer fomenting his own style of Dodge rebellion by reporting his Coronet "had 30 major defects when I let it go back to the bank."

At opposite ends of the poll (sic) though they may be, the comments pretty much summarize *PM's* survey of 1966 Coronet owners.

The loud praise is for handling, styling and ride, which received FMRs (frequency-of-mention ratings) of 44.5, 26.5 and 25.2 percent respectively.

Heavy-pedal squawks were raised against wind noise (14.8 percent), what the owners feel is shoddy workmanship (14.2 percent) and assorted rattles and squeaks (12.6 percent).

Other Coronet strong points, the owners report, are performance (15.7 percent) and overall economy (11.3 percent). Yet overall economy (rather, lack thereof) is also right up there on the gripe list (11.5 percent), followed at 8.7 percent by complaints about lack of headroom.

So it seems you pays your money and takes not only your choice, but also your chances.

Coronet owners responding to *PM's* survey rolled up a total of 1,189,754 miles during which they averaged 16.2 mpg for both around-town and long-trip

driving. Specifically, here's what they had to say for and against (all owner comments are listed in order of frequency mentioned; those in boldface type are the author's):

"I have to admit I'm pleasantly surprised by the overall handling of my Dodge."—Ohio crane operator.

"Steers and drives better than any; handles very well in traffic."—Missouri shoemaker.

"Torsion bar handling is what I like most about this car."—Washington salesman.

"Corners like a tiger."—California mechanic.

"Rally suspension makes it a solid car and it handles very well at highway speeds."—West Virginia teacher.

After its handling characteristics, Coronet owners just plain like the way the car looks. For example, a Michigan repairman says:

"It is one of the best looking cars on the road today, bar none."

"The car has a clean appearance."—California artist.

"The front end has a look all its own."—Iowa plant expediter.

► **The Dodge Boys fervently hope so, anyway.**

Some of the strongest praise for the Coronet boiled down to the car's riding characteristics. In *PM's* test car, an "as is" Dodge sales demonstrator from Scarsdale, N.Y., I found the ride to be typical of the Chrysler Corp. breed: that is, a palatable blend of rump-soothing mushiness and Spartan control:

"Rides like a heavier car with very good roadability. No side sway on curves at high speed."—Indiana businessman.

"It's comfortable to ride in, with smooth starting and stopping."—Minnesota farmer.

"Eats up the rough roads."—Nevada retired.

► **And spits nails, too.**

". . . the feel of the car is solid."—New Jersey businessman.

Owners like:

Handling	44.5%
Styling	26.5
Ride	25.2

But don't like:

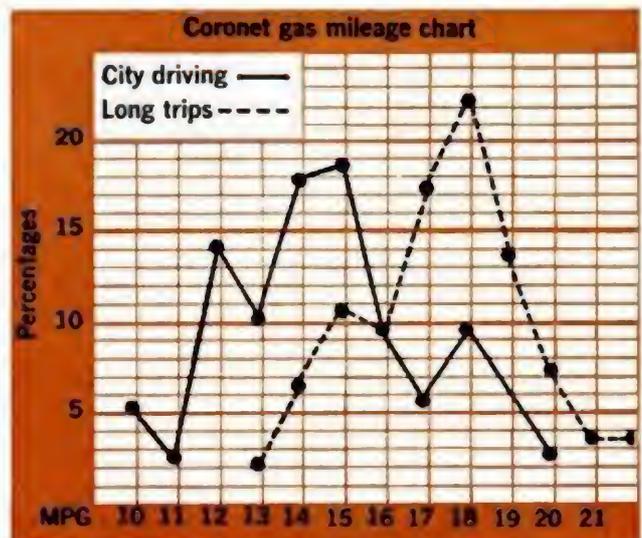
Wind noise	14.8
Workmanship	14.2
Rattles, squeaks	12.6



POOR FIT of body components, careless assembly and overall indifferent quality control brought forth the most vociferous complaints from Coronet owners



SAFETY DOOR HANDLES, say New York cab drivers, are often mistaken for ashtrays, at times resulting in a few surprises all around. Handles operate easily



CORONET GAS MILEAGE is about average for car of its power and weight. Engine options include a single 145-hp Six, four V8s ranging from 180 to 325 hp

Coronet owners who like the car's performance aren't the least bit stingy in their praise. It may be the current Batman nonsense, but several replies referred to the car's get-up-and-go in terms such as "zap," "whoosh" and "zowie":

"My car will outrun, outpull or outperform any competitive brand of car with equal horsepower."—Mississippi market manager.

"Plenty of zip. No trouble to pass at any time."—North Dakota farmer.

"It's faster than any car I've ever driven."—Texas mechanic.

► **The fact that Tex has the 325-hp V8 helps.**

"I like its lively zing."—Ohio programmer.

► **He obviously responds to beer commercials.**

Okay. For now enough huzzahs. Let's hear a few owner slings, arrows and brickbats. The big complaint about the Coronet is one that seems to be plaguing the entire industry—wind noise. Car buyers appear to like the idea of a quick box on wheels, but they wish it would zoom through its trajectory noiselessly:

"At 60 to 65 mph the wind noise is so loud a person has to holler to be heard. Dealer claims it's the body design and he can't fix it."—California clerk.

► **This dealer is telling the truth.**

"The wind noise around the doors is much too great."—Nebraska accountant.

"The whistling drives me nuts."—New York police officer.

Drawing almost as many complaints as

wind noise was what the owners deemed poor or, at least, indifferent workmanship. It's another industry-wide bugaboo. These people have a valid beef; with a high-ticket item like an automobile there's no excuse for what at best are sins of omission; at worst, acts of downright incompetence and indifference:

"Glove compartment was sprung, console panel damaged, dimmer switch did not work, selector panel light was not connected, 'Park' gear would not hold, backup light was not connected."—Ohio superintendent.

"When I got the car it would only go in 'R' and 'D' and the backup lights didn't work, the right-hand windshield wiper flew off, a long strip of chrome came off the left side, when it rained water poured in around the windshield, the transmission and differential leaked."—Texas repairman.

"Several chips in the paint job. A dent in the body had been painted over."—Missouri factory worker.

"The hood doesn't close properly, there are a lot of squeaks in the dash, the back-seat side panels don't fit anywhere near where they should."—Washington mailman.

"Trunk leaks dust to such an extent it and the back seat are unusable."—Iowa newspaperman.

► **These people are mad. One of these days there may be a march on Detroit to protest industry quality control. But customers are**

(Please turn to page 196)

Summary of Coronet Owners' Reports

Excellent 54.2% Good 36.1% Fair 7.2% Poor 2.5%

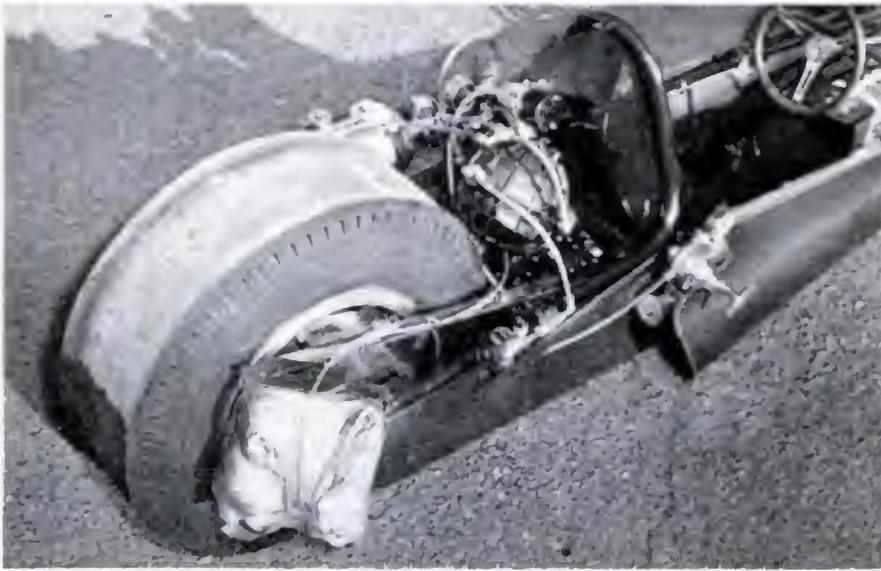
Best-liked features:	Spore tire location 2.9	Warranty/guarantee 6.2
Handling 44.5%	Car traded in:	Size 5.0
Styling 26.5	Dodge 32.4	Considered other makes?
Ride 25.2	Chevrolet 13.8	Yes 68.6
Performance 15.5	Plymouth 11.0	No 31.4
Economy 11.3	Ford 9.0	Own another car?
Comfort 9.2	Rambler 6.2	No 60.7
Interior styling 6.7	Comet 3.3	Yes 39.3
Visibility 6.3	Buick 2.9	Make of other car:
Least-liked features:	Falcon 2.4	Dodge 23.2
Wind noise 14.8	Others 16.6	Plymouth 19.0
Workmanship 14.2	Dealer service:	Chevrolet 13.7
Rattles 12.6	Excellent 50.2	Rambler 7.4
Poor economy 11.5	Average 35.4	Ford 7.4
Headroom 8.7	Poor 14.4	Others 52.8
Ashtray (dash) 5.5	Buy from dealer again?	Coronet transmission:
Brakes 4.9	Yes 79.1	Automatic 83.2
Handling 4.4	No 20.9	Three-speed manual 6.8
Road noise 4.4	Buy another Coronet?	Four-speed manual 5.6
Most like to see changed:	Yes 89.8	Not given 4.4
Headroom 10.4	No 10.2	Coronet engine:
Better workmanship 9.8	Bought Coronet because:	V8 80.4
Ashtray (dash) 6.4	Price or trade-in 49.1	Six 11.2
Wind leaks 5.2	Style 14.9	Not given 8.4
Taillights 4.0	Dealer 8.4	Total miles driven: 1,189,754
More engine options 3.5	Past experience 5.2	
Better performance 2.9		



A zooming 200 mph is the aim of dragster builder/driver Marlowe Treit of Portland, Ore., in a tiny three-wheeler called "Miss Demeanor II."

The package totals only 300 pounds, is powered by a Turbonique single-stage free-turbine weighing 58 pounds. Needing no gearbox or clutch assembly, power is delivered directly to the massive single rear wheel via a chain-and-sprocket arrangement.

Using only a fraction of the power available, Treit has topped 150 mph in standing quarter-mile practice runs.



Make-believe fireplace operates on electricity. Just plug it in and logs light up and glow (without heat), hi-fi set plays and hot plate warms coffee. Storage areas hold bar accessories and records. Made in Germany, it is sold complete or plans can be purchased for home project.



Rechargeable runabout. Speeds of 20 to 25 mph over distances of up to 25 miles on a single charge are routine for this electric runabout designed and built by George B. Vasen, Quincy, Ill. Using running gear from a '49 Crosley, Vasen added motor power via a Delco-Remy 12-volt bus generator. Juice comes from five 6-volt batteries. Car has four forward speeds, reverse. Body is of plywood and aluminum, all joints glued and screw-fastened.

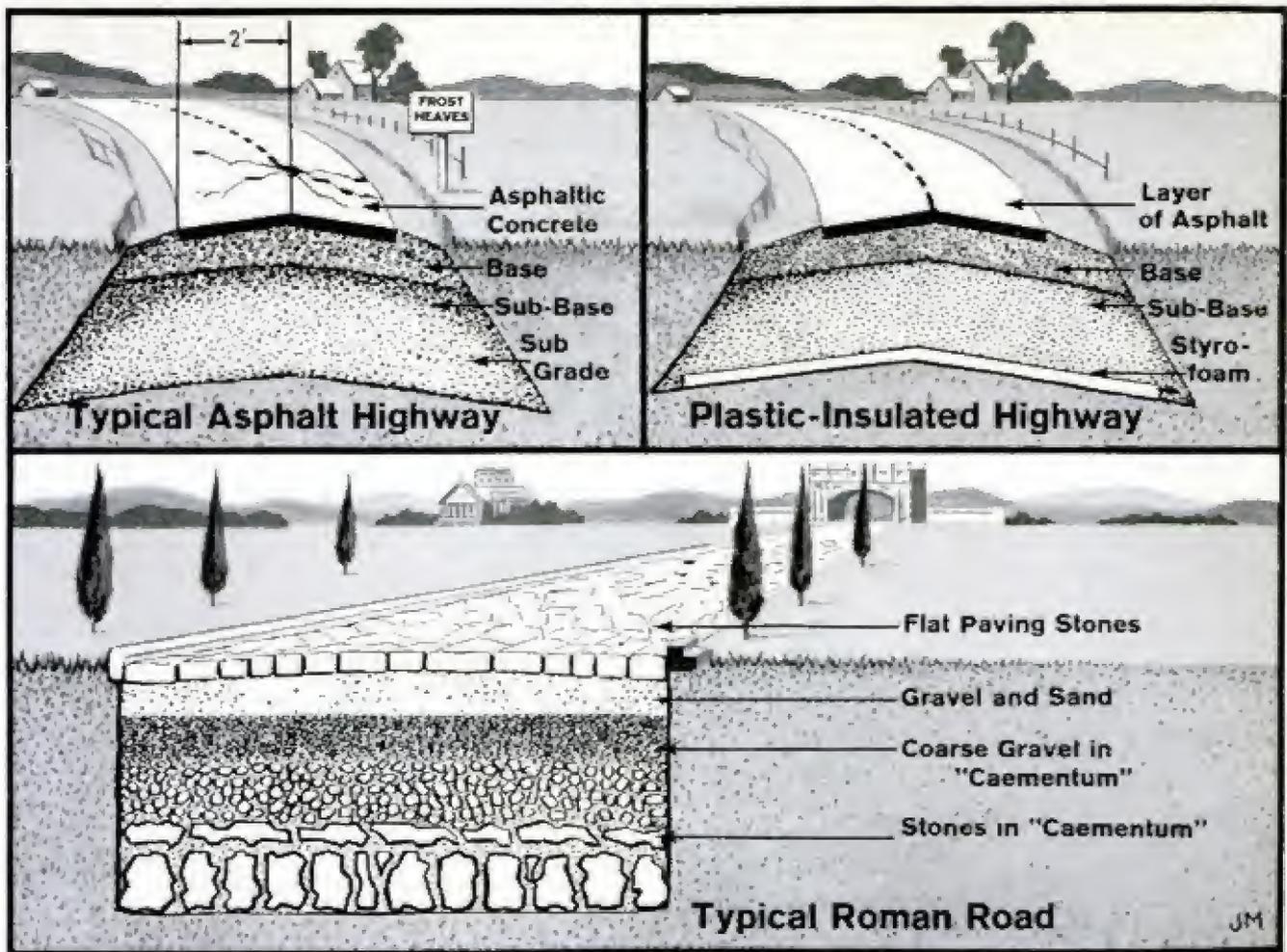


STYROFOAM BOARDS are pegged into ground with wooden skewers to insulate roadbed from frost destruction

Plastic Highways,



SUBBASE MATERIAL is rolled over foam plastic. This will be topped with asphalt. Concrete uses no subbase



TWO TYPES of modern highways compared with old Roman roads. Typical Roman road was dug much deeper

By Caesar! By Clifford B. Hicks

HOW DID THE ROMANS build highways?

This innocent question has turned up a "new" construction technique that promises to save millions of dollars annually.

Because the Romans intended their empire to last forever, they built their highways to last accordingly. The empire passed, but the highways endured. Roman engineers built nearly 250,000 miles of highways; you can still ride them in comfort from northern Europe to Ethiopia.

The secret was the way the Roman engineers prevented frost damage. They solved this problem by removing existing soil to depths of more than eight feet—and replacing that soil with materials which would not freeze. In most cases these materials consisted of stones (of decreasing size from bottom to top) laid in "caementum," a material almost as good as modern cement. Frost could not penetrate and heave such a roadbed; ergo, the roads lasted 20 centuries.

Experts at Purdue University's School of Civil Engineering tackled the same

problem of frost damage with the help of Dow Chemical Co. research. Their solution to the age-old problem may not go as deep as that of the Roman engineers, but tests indicate it is even more effective, and much less work.

Sections of highway in Manitoba, Michigan, Minnesota and Iowa have been underlaid with Styrofoam boards, to insulate the pavement from frost. The blocks are pegged into place with wooden spikes, then overlaid directly with concrete, or with a sand and gravel subbase and then covered with asphalt.

The results have been spectacular. In the Iowa installation, for example, a 1½-inch layer of foam plastic has replaced more than three feet of conventional granular material, and provided superior protection from frost damage.

As a result of the research, you may soon be riding on "foam-plastic highways." You may also pay relatively low taxes for highway upkeep—as did your Roman counterpart.

Big business takes

Part 2 of our underwater frontier exploration: American industry joins



a dive in the ocean

the ocean-bottom search for new sources of food and raw materials.

By HANS FANTEL

NINE FEET HIGH and wide enough to hold two men, the round steel chamber looks like an outsize howitzer shell with warts and windows. Pipes and high-pressure hoses crawl over its bright yellow surface like an exuberant vine. Hissing and snorting, compressed gas spurts from relief valves.

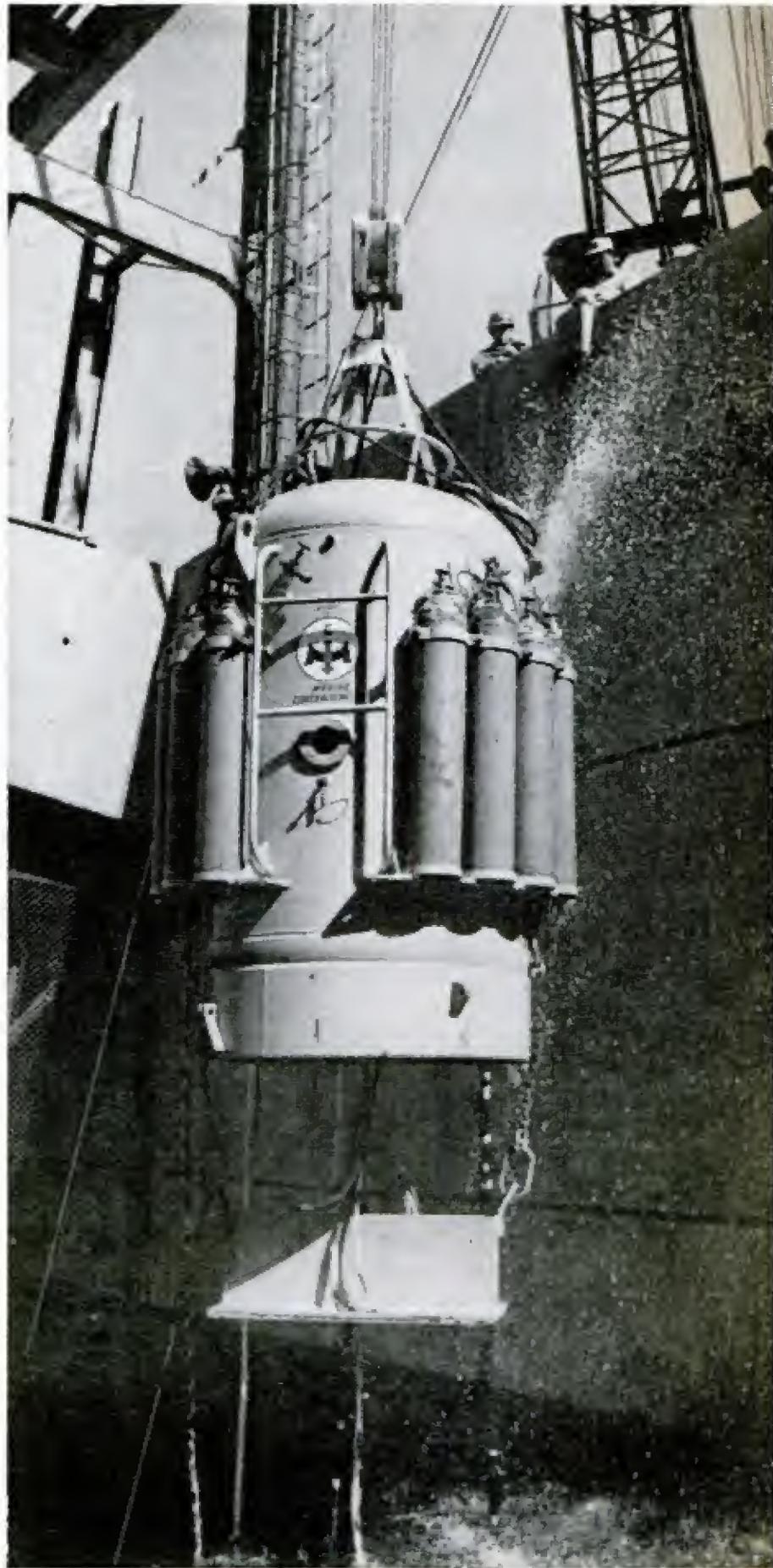
The whole contraption dangles out over the water, hanging from a crane. Then as the crane plays out its line, it plops into the waves, gurgles and sinks.

The odd item just submerged is the newest of a new breed of diving gear that is now spear-heading the human invasion of the ocean floor. Unlike diving craft designed merely to explore the ocean, the *Cachelot* means to put men and machines to work in the sea.

The *Cachelot* is a typical example of the new machinery that is now sparking a business boom on the ocean floor. A growing number of the country's biggest companies have taken the plunge. Some have already set up shop on the sea bottom:

- Off the African coast, they're blasting the sea floor with powerful jets and sucking up high-grade diamonds.
- In the Pacific, a 14-foot robot stalks the offshore oilfields near Oregon, maintaining undersea wells and pipelines with wrench-like "hands."
- In the Bahamas, ocean-mining machines dig for oolitic aragonite, a vital source of chemicals

UNDERWATER SEARCH for profits was accelerated by breakthrough in diving techniques. Pressurized housings, like *Cachelot* (right), take divers down to desired depths, allow them to work outside and return without former time-consuming slow ascent





REMOTE-CONTROL MOBOT is sent to bottom by itself and operated from control panel aboard mother ship

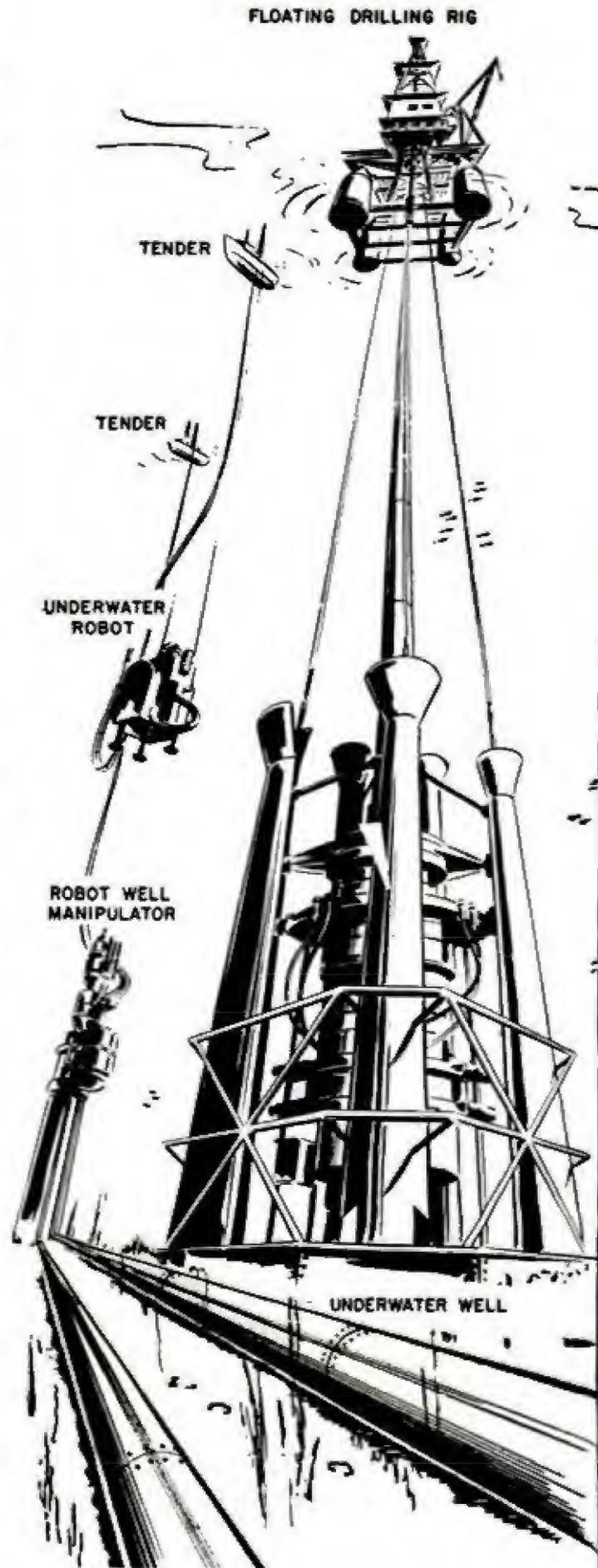
used in making steel, fertilizer and feed.
 • In Alaska, the gold rush is on again—this time underwater. Deep dredges are hauling up nuggets near Nome.

• Strange underwater craft are under test by the Navy—surface-controlled diving robots equipped with grasping claws and huge snares to recover missiles from the ocean and for salvage of sunken ships.

Even stranger machines are already taking shape:

• Remote-controlled bottom crawlers to pick up the lumps of magnesium and iron that cobble the Pacific floor.

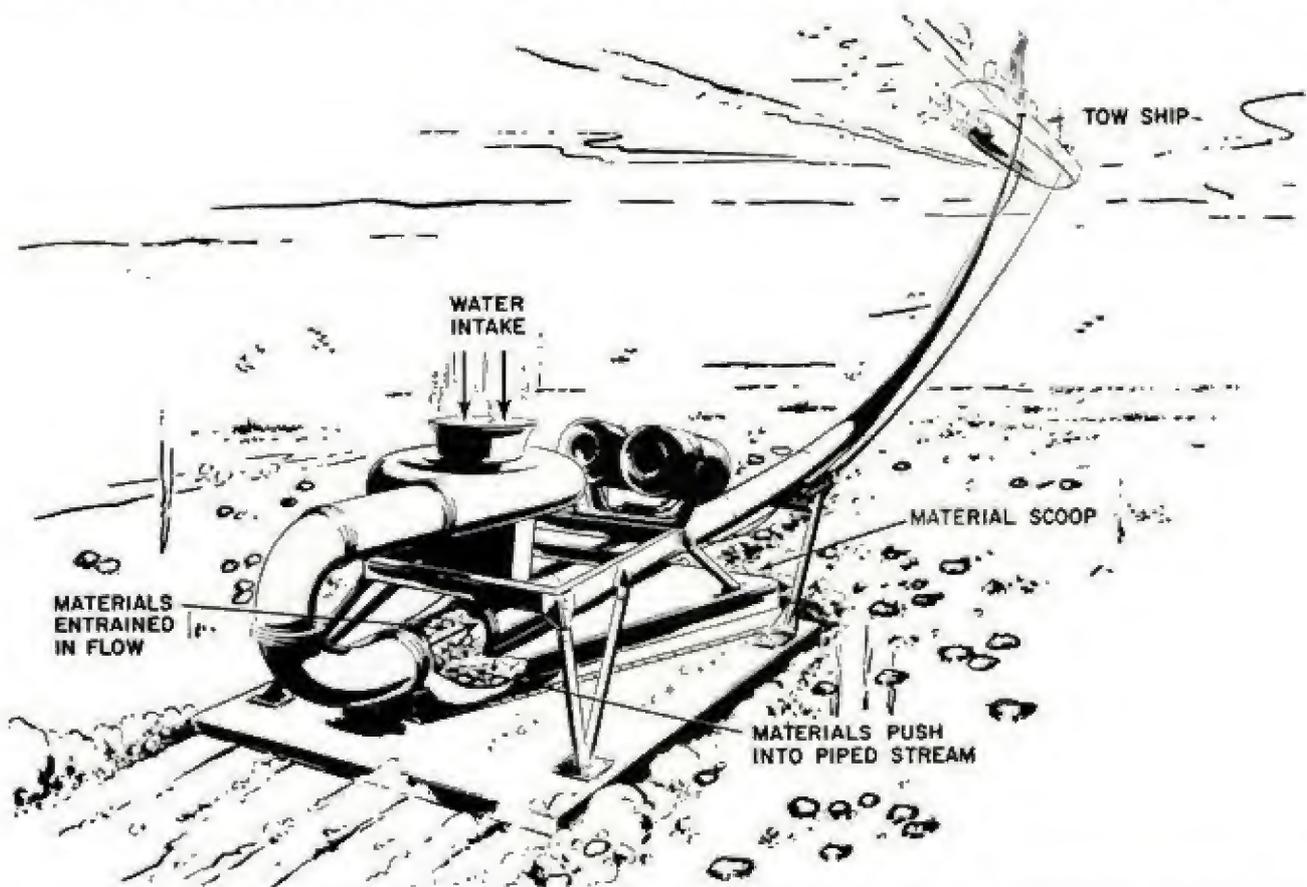
• “Rock-Eaters” to bite into the ocean bottom like termites into wood, chewing their way along veins of valuable ore.



DEEP-SEA DRILLING RIG, shown here in Smithsonian Institution model, will work oil fields on ocean floors up to 2000 feet below surface within 20 years



UNDERWATER WORK, except for water, is as routine as any on surface. And with new diving equipment men can stay down much longer than in old days when an hour's work meant tedious five-hour ascent to surface



DREDGING RIG, a form of strip mining, will scrape off top of ocean floor for valuable minerals. One enterprising company has already sucked diamonds off bottom mud along African coast near Cape of Good Hope

The mounting pace of undersea activity evidences a new trend in American industry: Big business takes a dive.

Even though the vast territory beneath the sea is still mostly unknown, we've already had a few glimpses of what's waiting there. Rich lodes of iron and titanium run through the continental shelves—the shallow depths that surround the continents. Phosphors are plentiful, promising to relieve a worldwide shortage of fertilizer. Deeper down, vast deposits of copper, cobalt, manganese and platinum await the undersea prospector. Sunken beaches and submerged rivers off the coasts of Thailand and Indonesia hold tin ores. And submarine oil reserves

are estimated to exceed the total land-based supply.

But the most vital product to be gained from the sea is neither oil nor minerals—it's food. With half the world hungry and the food crisis growing worse rapidly, ocean scientists point out that the continental shelves alone provide an estimated 85 percent of the edible protein needed to feed the global population.

Up till now, these riches have been unreachable. The best that men could do was to explore small patches of ocean floor—sometimes with submersible craft but more often just by dangling instruments from surface ships. Lately, empha-

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HERE COMES

MR. PARADE

From Atlantic City to Liberia, LeRoy Vaughn is the man they see when it comes to staging a first-class parade

By A. R. ROALMAN

HE'S A QUIET MAN who doesn't smile often, but he has helped produce more noisy, fun-filled parades than any other man in history.

On a given day, LeRoy Franklin Vaughn may be working with a junior chamber of commerce group that wants to organize a parade for a California city, the commercial trade director of a new African nation, a representative from a Pennsylvania Lions Club, promotion men from Australia, Florida's Orange Bowl committee, and officials of a northeastern city getting ready to celebrate an anniversary.

Or an enthusiastic Texan may be talking to Vaughn by phone: "We're going to celebrate our 100th birthday next year and we want the biggest parade anybody ever put together. We understand you know how to do these things."

The big Texan understands right. Vaughn has built floats for thousands of parades. His huge works of art have appeared in everything from the Miss America Pageant to Miami's Orange Bowl and the Minneapolis Aquatennial bash.

Rare indeed is the parade, no matter how small or large—from an amateur Fourth of July march in Glen Ellyn, Ill., to the St. Patrick's Day marathon in New York—that doesn't have Vaughn materials or advice in it. Each parade demands a high order of



PARADE FLOATS start with a sketch, and art director James Baran (left) confers on an original design with LeRoy Vaughn before construction begins



MILES OF COLORFUL PAPER are used to cover the floats; Vaughn's factory has ovens where the tissue is dried to backing before being pinned into place



THE ANIMAL FARM is the section where papier-mâché animals are built. A workman, finished with a cow, staples the final touches to a donkey's head



BIGGER THAN LIFE, the products of the parade factory are mostly make believe. This huge ear of corn is made of a papier-mâché and it weighs 20 pounds

mechanical skills and entertainment know-how.

"Putting on a parade is like putting on a Broadway production," muses Vaughn. "You've got to entertain. Really entertain. Millions of people go to parades in the United States. Baseball and football get very few spectators compared with parades. But parade watchers want entertainment."

Vaughn and his experts are paid handsome fees to fly all over the world from their Minneapolis base to consult with parade organizers and provide that entertainment.

"The toughest people to work with are the townsfolk who are having an anniversary celebration," says Vaughn. "An anniversary parade is a one-time thing and they've never produced one before. Most of them think a parade is fairly simple—you just get some floats, some pretty girls, some bands and away you go."

In fact, he points out, you must be worried about such seemingly mundane things as:

- *Which float goes first in the parade?* "Everybody wants to be first, and the amateur chairman thinks the best float should be first. It shouldn't. It should be last."

- *How high are the telephone wires on the parade route?* "There's nothing sadder than a long line of pretty floats stopped dead by a power line."

- *How close together should band units be spotted if the buildings along the parade route are high?* "Band music echoes off high walls and gets all mixed up if the units are too close together."

- *What if some units are late in arriving for the start?* "You start on time, no matter what. Go."

- *What to do with the parade after it ends?* "Few people think of this. I've seen an inexperienced parade organizer plan everything well, except that he had no place for the parade units to disband. When the first unit reached the end of the parade route, it just stopped. So did the second, and pretty soon that parade was backed up for blocks. Those poor bands blew up a storm waiting for somebody up ahead to start moving."

Problems come in all sizes and shapes. Consider the sad plight of a medium-sized northern city. In the parade was a



CHRISTMAS AND THE SPACE AGE are intermingled as a workman applies a coat of paint to a simulated rocket and large holiday ornaments hang in rear



AMERICAN EAGLE is a popular item for Fourth of July parades. The papier-mâché department always has a supply on hand, like this one being painted



LIFE CAN BE ROUGH on parade float animals, and the repair department at Vaughn's factory is always busy with jobs like repairing this deer's leg

troupe of marchers dressed like early American trappers. Several carried muzzle-loading rifles, loaded to the muzzles with blanks.

It was a great day for a parade and the trappers were in a fine mood. When the parade got under way, some of the more exuberant pointed their guns to the sky and blazed away. Blam! Several horses in the following contingent bolted and suddenly everyone was scrambling for safety, including spectators, horses, riders and the intrepid trappers in the coonskin caps. It made an exciting—but terrifying—climax to a poorly planned parade.

Souvenirs can be dangerous

In another town, one of the floats had a pretty girl who was throwing small souvenirs to the crowd. As often happens in such situations, children scrambled into the street and grabbed for the trinkets. Two were seriously injured when a horse bolted into the crowd of youngsters swarming around. ("Parades shouldn't have anyone throwing souvenirs," warns Vaughn. "It creates an invitation for children to leave the curb and dart toward the parade floats.")

Parades in the United States aren't the same as those in Europe, Asia or South America. Ours are made to look at; parades in many other countries are designed for complete participation—everybody parades and there are no spectators.

Vaughn describes the horror of one parade-float builder who was not familiar with this difference. He built a beautiful float for a Caribbean island parade. In the United States, the float would have drawn gasps of appreciation. In a land where residents joined in the fun, the float crumpled with the first onslaught and, two blocks later, looked like a crawling stack of wastepaper. Delicate outriggers were snapped off, flimsy decorations smashed and torn, and the "queens" riding on the carefully balanced float felt like they were on a roller coaster that had flown off the tracks. Fortunately, the local citizens were having such a good time they hardly noticed.

Vaughn's experience with parades goes back to Iowa, where he was born 59 years ago. In those days the Midwest was parade-happy. In addition to its own parades, every town experienced a bang-

up circus parade once a year. Vaughn fell in love with the blaring bands and wildly decorated animal wagons.

By 1929 Vaughn was in Tucson, Ariz., working in a dime store; he suddenly became the window trimmer when the regular man became ill. He carried the experience with him during the next few years of the Depression as he drifted around seeking work. Finally he settled in Florida, where he opened a window-trimming business. In 1936, he designed and built seven floats for Fort Lauderdale's Labor Day parade.

Six days before the Fourth of July, 1938, Vaughn and his wife rolled into Bemidji, Minn., a resort town, on a vacation.

"The town was all set for a parade, but nobody knew how to make a float," recalls Vaughn. "When we said we had

Tip to do-it-yourselfers:

Read "How to Frame a Float"
on pages 145-147

such experience, we were hired on the spot to decorate nine of them for \$50 each. That's when I got the idea that maybe I could make a career out of parades.

"That also was the year the Orange Bowl became a national event, and I got the contract for several floats in that parade."

The next year he got contracts for a dozen or so floats that were to participate in the Blue and Gray parade in Montgomery, Ala., and the year after that came contracts to build floats for the Aquatennial parade in Minneapolis.

During World War II, Vaughn's factory turned out materials for patriotic parades. One of his productions, a 40-foot replica of the USS *Minneapolis*, was perhaps the "most viewed" cruiser of the war. Hundreds of thousands of people saw it during those years.

By the end of the war he was operating from a converted ice-skating rink, had about 15 employees, and was producing all the floats and many of the stage props for the Miss America Pageant in Atlantic City.

"We used to make floats in Minneapolis for Atlantic City and ship them from here on special freight cars. Once in a while somebody would come up during

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NEW FOR
YOUR HOME
 BY MARION MOREY



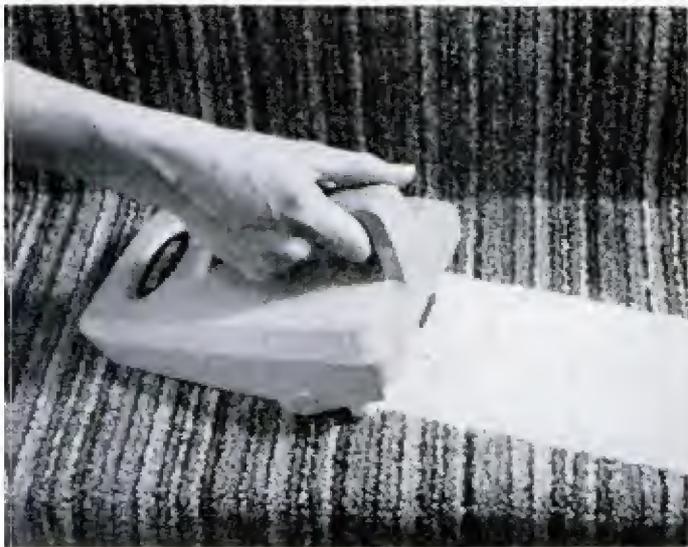
CLOTHES DRYER, mirror, light, radio, barometer and clock are one combination in a new "Inner-Wall" cabinet series. Just 5½ inches deep, unit can be built in or hung on wall. Howard Miller Clock Co., Zeeland, Mich.



OPEN-HEARTH GRILL holds charcoal vertically so both sides cook meat and grease doesn't drip on coals. You can perk coffee or fry potatoes on top grill. Cast-iron movable unit costs \$48. Ratcliffe & Sons, Marengo, Ill.



ANTIQUING PROCESS for furniture and woodwork takes just two steps; base coat goes right over old finish. Kits, complete to paint stirrers, are \$4.95, will do two chairs, Acme Quality Paints, 8250 St. Aubin, Detroit, Mich.



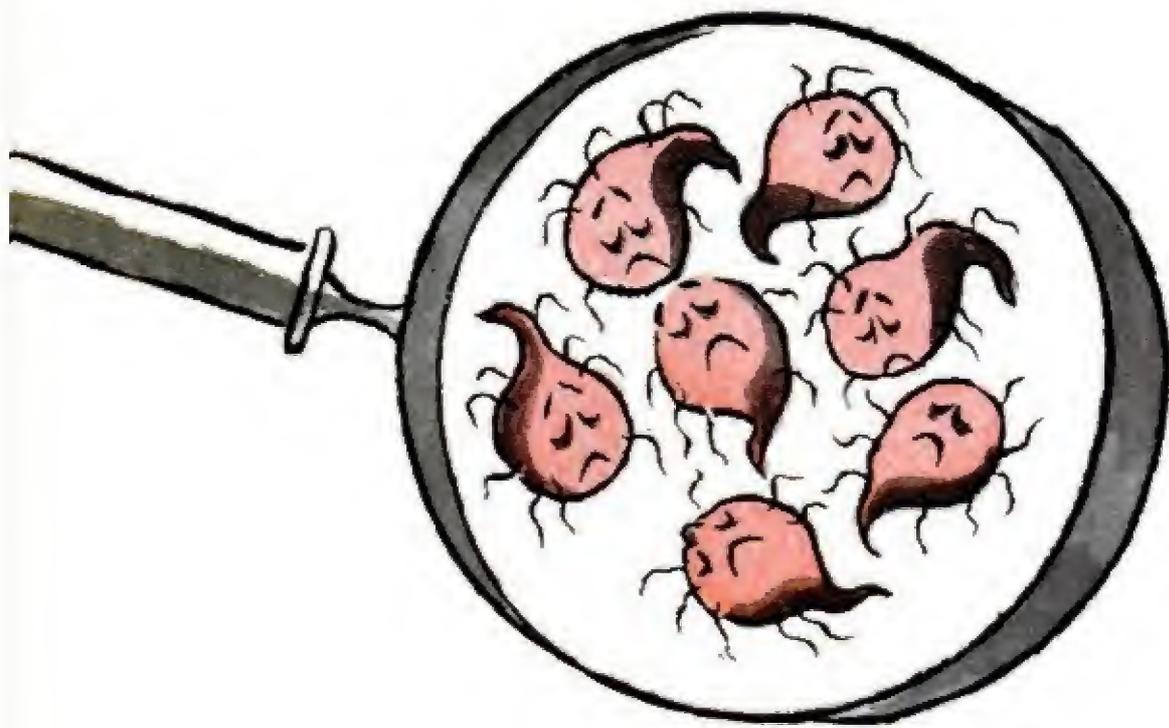
CARPET CLEANUP hand applicator works well on high-traffic areas such as stairs and car rugs. Sponge roller with snap-out brush head spreads powder and brushes it in. Vacuum picks up dirt later. \$4.95. By Bissell.



FAT SEPARATOR removes all liquid fat from soups to gravy stock while it's hot. Fat rises to top of heat-resistant container in seconds and clear broth pours out spout. \$4 from Fat-A-Way, Dept. TH-35, Albany, Ore.



AUTOMATIC PAPER TOWEL DISPENSER unrolls one towel at a time at the push of a button—then locks into place as you tear off towel. Both right and lefthanders can avoid the usual "wet-grab" for towels. Flashlight batteries operate the dispenser. It mounts under cupboards, to the side of a sink, virtually anywhere. The light, rustproof units of enameled aluminum are available for \$7.95 from Nassau Shores H & G, 5500 Merrick Rd., Massapequa, N.Y.



Bye-bye, bacteria!

The clothes we wear, the rooms we live in, the beds we sleep in are now being made with built-in germ resistance—but don't count on its effectiveness in every case. / By Theodore Irwin

AFTER A ROUND OF GOLF, you walk barefoot in the clubhouse locker room, unaware that the concrete floor has been impregnated with a special chemical to ward off the fungus causing athlete's foot. Buying a new hat in a store, the leather bands and lining of those you try on may be wholly free of any nasty germs from some other customer's hair. If you're planning to wood-panel a room at home, you can even get plywood with "sealed-in" protection against sundry bacteria and fungus.

Almost everywhere you turn nowadays, a silent built-in war is going on against unfriendly bacteria. It's not enough that Americans, fanatics on cleanliness, take 500 million baths a week. Avidly we go for whatever is marked "germ-proof," "sanitized," "antiseptic" or "bacteriostatic." The trend has so accelerated that today at least 7000 different consumer items are infused with germ-discouraging chemicals, helping to sell a whopping billion dollars in products each year. More and more, smart businessmen are trading on our fear and horror of germs.

Reputable companies, however, have learned to be cautious in their claims, using words like "retards," "inhibits," "repels" or "resists" germ growth, "bacteria fighters" and "bacterial barriers." But fly-by-nights, attracted to the gold in them that pills, use such phrases as *permanent miracle germicide* or *kills all bacteria*. The federal government, through the biological unit of the Department of Agriculture, cracks down on wild claims.

The trend, nevertheless, has been catching on like wildfire. Consider our clothes,

for instance. Microbe-resistant chemicals have been added in the manufacture of everything from socks and shirts to girdles and bras, infants' training pants and men's suits. J.C. Penney has treated more than 100 million pairs of shoes. In knit fabrics and garments, at least 14 different chemical formulas are involved. During the last Olympics in Tokyo, every warm-up suit worn by the U.S. team was made from a germ-repelling material.

Chemically-treated underwear, however, can have a drawback. Three years ago, a manufacturer overtreated a brand of men's shorts. Result: Many men suffered intolerable skin irritations. Legal suits had to be settled, merchandise pulled off shelves and burned—for a loss of some \$100,000. So today you'd have a hard time finding any "germ-free" men's underwear.

Much antigerm activity lately has been seen with paper products—napkins, tissues, disposable diapers and garbage bags with locked-in defenses against a host of organisms. Our government watchdogs are keeping an eye on some, particularly kitchen-shelf paper fortified with a "poison" for roaches. What happens if raw food is put on the shelf paper or a child chews on the paper? Investigation is under way.

Some self-sterilizing paints, said to be bacteria-hostile and mildewproof, have been introduced. One, which boasted that it "kills TB germs," vanished from the market after the government stepped in. But a number of floor paints are available to kill the spores of athlete's-foot fungus.

Germ-rebuffing floor waxes have been tried but use of too much chemical might be dangerous to toddlers. Tile manufacturers have been attracted to the gimmick for shower-room floors and approaches to swimming pools; and chemicals may go into the cracks between tiles. At least one big company has developed a special floor cement.

For ceilings, acoustical tile producers have come up with a new surface that doesn't trap dust and bacteria. You'll find it in hospitals, where epidemics of staph infections have long been a problem. Dread of the insidious staphylococcus has even led to germ-repelling casters on hospital beds that may be rolled from one room to another. The company's slogan: "Don't give staph a free ride!"

For plastic, rubber and cloth toys, the chemicals tend to be tied up so thoroughly that they're not dangerous to children. But how germ-free are they? After examining them, Dr. Leander S. Stuart, the veteran USDA microbiologist, told



UNTREATED AND TREATED carpet samples illustrate effectiveness of bacteriostat chemical. Treated sample (right) builds up "zone of inhibition," although no treatment can claim complete inhibition



RESEARCH LABORATORIES, independently operated, test claims of "germ-resistant" products. Best consumer can hope for is partial germ protection

PM: "No, they're not aseptic. There's no guaranteed protection."

Similarly, when the maker of a plastic nursing bottle said it was "self-sanitizing in use," tests showed that not enough of the germ-fighting chemical leached out of the plastic to do any good. If the chemical—phenylmercuric borate—did percolate out, it could cause infant diarrhea. The claim had to be dropped.

Still the bacteriological warfare continues hot with blankets, towels, draperies, curtains, bathmats and tablecloths—all locked into the fabrics. Treated pillows proved a great success. One store chain, in an experiment, displayed "germproof" pillows at a higher price than the same quality pillows without the added attraction. The higher priced, germproof pillows

sold out before the other pile was touched.

One of the largest-selling toothbrushes has "germ-barrier" chemicals in the bristles, backing and handle. Brush your teeth, hang up the toothbrush and before it's dry the bacterial count is down to a low level, contends the manufacturer. Chemicals, leaching out in tiny amounts, are said to last for months.

Among the latest to be treated with built-in bacteriostats are women's wigs and hair curlers. And you can buy germ-resistant shades, luggage, carpeting, shower curtains, serving trays and plastic dish-washing racks.

Notice that we keep saying "germ-resistant" rather than "germ killers." The Department of Agriculture draws a sharp distinction. *Bacteriostats* must prevent growth of bacteria. *Sanitizers* must reduce bacterial counts to safe levels, as judged by public health requirements. *Fungistats* must stop development of fungi. In contrast, a *germicide* must not only prevent growth but kill all bacteria except those forming spores.

Microbes against which we are—hopefully—safeguarded range from *salmonella* (food poisoning, gastroenteritis, typhoid) to *streptococcus pyogenes* (throat infections). If everything you wore and used did a complete germ-battling job, you'd also have "protection" against dysentery, TB, infants' diarrhea, whooping cough, diphtheria, glandular fever, carbuncles and boils.

Germ-inhibiting chemicals generally used today are organic tins—Bis (tri-n-butyltin) oxide—and nonmetallic organic compounds such as salicylic acid, quaternary ammonium salts, the "mir-

DARTMOUTH FOOTBALL TEAM won the Ivy League Championship in 1965 after eliminating a plague of infections



acle" hexachlorophene and some antibiotics like neomycin. All are well-known enemies of microbes. Chemicals are sold directly to manufacturers or specific formulas are tailor-made for certain products by companies specializing in the field.

With 125 different formulations, the front-running specialist is Sanitized, Inc. of New York, which markets its chemicals under the trademark "Sanitized." The business of making bacteria uncomfortable was first sparked back in World War I when chemist L.D. Clement developed "Sanitized" while working with the U.S. Army. Experimenting with chemical warfare gases, Clement noticed one gas sterilized the soil for a long period.

But not until 1933 was Sanitized, Inc. set up to make the formula—then, primarily zinc and magnesium chloride. Slowly it started to take hold in the manufacture of shoe and suit linings. The big boom in bacteriostats finally broke out a few years ago when American businessmen woke up to the great selling power of "treated" products. Today, Sanitized, Inc. licenses over 900 manufacturers and its trademark is registered worldwide.

Another leader in the industry is the giant M&T Chemicals, Inc. of Rahway, N.J., which promotes bio-Met (trademarked) for "hygienic protection" in over 50 types of products. In all, at least 25 companies sell components for bacteriostats in consumer goods.

You and I are paying for such protection. Just how effective is all this built-in anti-germ warfare? Mrs. Bettyjane Hilton, president of Sanitized, Inc., points out that 30,000 quality control tests of Sanitized-treated products were made last

year by independent research labs. Each licensee must submit a product sample each month for various checks, depending on claims made. If, for example, a Sanitized-treated shirt is said to be "durable" in its protection, it goes through 15 washings and is then tested to see if the chemical is still there.

For an objective appraisal, we turn to Dr. Stuart, for 20 years the man to convince at the Department of Agriculture's bacteriological unit. All germicidal chemicals used in inanimate surfaces are under federal jurisdiction and must be registered as "economic poisons." For enforcement, the department has three microbiologists in Washington, four at the Agricultural Research Center in Beltsville, Md. and 16 field investigators.

With sophisticated lab techniques, including infrared and ultraviolet spectrophotometric methods and gas chromatography, Dr. Stuart and his staff can detect quantities of chemicals in parts per billion in samples submitted to them.

Evaluating the crop of germ-resistant products, Dr. Stuart is inclined to be wryly skeptical. "You have to be from Missouri," he says.

Interviewed a few weeks ago for *PM*, Dr. Stuart stressed these points:

"Many bacteria die themselves at a terrific rate, under ordinary conditions. But it's hard to kill the very resistant staph and TB germs. The most you can expect is a mitigating effect that reduces the chances of infection by some degree. However, if a bacteriostat prevents one person out of a hundred from getting an infection, then I believe it's worthwhile. But people

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Scooped-out cruiser design of the Viking 24 combines high freeboard with plenty of fish-fighting room. You have a choice of control stations—the one shown here or a much more compact model. Able to shave 34 mph with a single 110-hp outdrive, it should be great for anything from family camping afloat to off-shore fishing.



Dial-a-shave design of the new Remington 300 Selectro Shaver features dial-controlled shaving heads which raise through four different shaving positions, a pop-up position for trimming sideburns and a flip-open position for cleaning. The suggested retail price is \$32.95.



The ear-pounding crash of the pile driver isn't heard with the Bodine Resonant Driver atop pile in photo. Two gasoline engines energize a mechanical oscillator that makes pile vibrate so strongly that the soil breaks apart, letting pile slip in. The Bodine rig also is said to be much faster than conventional pile drivers.



Everything but a varsity letter is included in a new kit which converts any canoe into a racing scull. Designed by a college crew coach, the "Canoe-Swift" is made by Tool Tech Corp., Windsor Locks, Conn., and is priced at \$175.00.



Walls for wandering farms

Annual rains remove tons of topsoil. The solution, says a self-taught engineer, is a unique system of dikes. Some experts snort, but satisfied farmers say it works

By ARTHUR WHITMAN, Photos—CURT GUNTHER

PRESENT LAND AND WATER CONSERVATION practices are worse than nothing—they're harmful and wasteful," says Krekel Karch of Harristown, Ill. "I'm not the only man in the country who knows the extent of the waste, but I probably am the only man who can end it."

Karch, a big cavalry charge of a man, means what he says; he's not given to idle boasting. And many people are beginning to agree with him—both that present practice is bad and that he's the man who can do something about it.

The heart of the water-control problem, from which stem such other problems as soil erosion, floods and lowered underground water tables, is to keep rain (and melting snow) from running off the farms and woodlands that make up the upland watersheds of rivers, lakes and reservoirs. Conservation measures are essentially the same for farm and forest. Land is terraced along its higher elevations, with fields broken into small sections separated by ditches or "waterways." During a rain that lasts any time at all, a percentage of the water that falls soaks into the soil. The rest puddles over the surface and runs down the terrace slopes to the waterways. These carry it to

larger roadside ditches and, eventually, to streams, lakes, rivers and the sea.

"The net effect of the practice is to squander the farmer's two most precious resources—land and water," says Karch. "The water loss is obvious. It just runs away. The land is lost in two ways. One is that area devoted to ditches is nonproductive, the other is that the water washes tons of topsoil off the land every year."

The extent of this topsoil loss is staggering. Engineers, who gauge losses with complex formulas based on amounts of rain falling yearly on different types of soil, estimate that 4 billion cubic yards of topsoil wash off American farms every year. This lost soil adds to the water problem, in turn, by silting up lakes and rivers, often polluting them with chemical fertilizers. In Karch's own central Illinois, conservation authorities think in terms of a "perfection level" attainable with standard practices that assumes a loss of five tons of topsoil per acre per year. Less perfect control results in per-acre losses of hundreds of tons a year, literally shrinking farms as useful land turns into eroded gulleys.

Karch's approach is almost the direct



BEFORE: Water runoff cut a channel through this field in Illinois. The badly eroded tract couldn't sustain crops and remained unplanted for 50 years



ALUMINUM PIPES that Krekel Karch straddles are installed in base of dike to provide drain for water that might otherwise remain on land too long

opposite of standard practice—he holds the rain on the land. He became convinced during his boyhood on an Illinois farm that standard practices were all wrong. "My old man went by the conservation book," he says, "but it didn't make a damn bit of difference to anything. Come a dry year, you'd pray for rain. Finally you'd see some, and all it would do was wash away half the topsoil, carrying it off to silt up the cattle pond."

Completely self-taught as an engineer, the six-foot-three, 230-pound Karch experimented with his own ideas as a sideline to a small, prosperous earthmoving and roadbuilding firm that has supported him for years. He finally came up with an ingeniously simple technique he calls by the jawbreaking name, Hydrosol Intransitive Land Engineering (HILE) on which he has obtained patents in the United States and 12 other countries.



AFTER: In 1945 Karch installed water-retaining dikes on the field. That same fall, the farmer harvested crops that more than paid for Karch's work

HILE starts with the grade-school science principle that the ability of water to carry suspended matter depends on the speed at which the water flows. Fast-running water can carry a heavy soil burden. Slow water carries less; still water, none. "The principle is as old as the Egyptians," says Karch. "They figured it out from watching the Nile flood every year, drop topsoil it had picked up a thousand miles away and recede, leaving them with fertile fields. Somehow, though, the principle got lost in the conservation shuffle."

To put the misplaced principle to work again, Karch starts out by leveling fields with the earth. That is, he follows natural benches and elevations in the land, as determined by surveying, so that when he is through, the surface of the field is smooth, although the field is not flat. Next, he builds one or more HILE structures, as

may be required. These are earthen dikes set across the paths where water would tend to flow off the land. The structures slope gently and are farmed along with the rest of the field.

When it rains, water backs up behind a HILE structure to form a broad, shallow pool. Fast-moving water, coming off higher elevations, strikes the pool, drops its soil and becomes still itself, extending the existing pool to stop ever more water and soil in a continuing cycle. Multi-structure installations are designed so that when the pool behind one grows too large and water begins to run off, it can flow only into another pool, behind another dike. Thus an interrelated series of pools may cover an entire field after only relatively small amounts of rain.

To keep pools from standing too long, souring the soil and damaging crops, Karch installs a straight pipe through the base of each structure. By varying the size of the openings, he discharges water slowly past the dike in calculated periods of time—usually 18 to 60 hours. Since few rains last this long, most of the overflow occurs after the rain has stopped and all but the deepest pools are

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FLOW OF WATER through drains is controlled by plate at end of pipe. By varying size of opening in plate, water is run off at a predetermined rate



Steps to better hunting are crank-shaped rods with a wood-screw end that are easily turned into the trunk of a tree—without injury to the tree—making it simple for a hunter to climb above the ground for better visibility and safety. A set of four steps cost \$8.95 from Deer Me, Box 345, Anoka, Minn.



New life preserver, worn like a parachute harness, includes usual water wings, blinker light and whistle, plus hoist ring for easy rescue at sea. Wings, when deflated, fit snugly under the arms, and whole rig can be worn during daily chores without discomfort. Wings inflate automatically.



New robot bank teller does everything but smile. It "reads" the denominations of coins and bills, totals them, and stamps the receipt. All the customer has to do is put money in proper slots and make out a deposit slip. The device is being tested in several banks in Florida.



Water runner is a 13-foot contraption that's made for walking on water. To make it go, you simply slip your feet into shoe stirrups and start running. It was developed by Loyd J. Livaudais, Memphis, Tenn., who hopes to manufacture it commercially. His pilot model weighs 150 pounds and folds to fit in a station wagon.



Oysters by the string—that's the way they're grown at a Bureau of Fisheries lab on the Maryland shore. They're suspended in batches of 30 from plastic cords that hang from the bottom of a raft (shown). The suspended oysters grow faster than their bottom-dwelling cousins, say researchers, and their quality is better.



This seat warms you—from your own body heat. The heat is absorbed by the cellular-foam structure of the Kozy Cushion and is immediately reflected back to the user's body. The seat weighs just one pound and folds for carrying or storage. Made by Borg-Warner, it is sold by automotive and department stores.

STILL A

TIGER

IN YOUR TOOLSHED

They're loading mowers with safety features, but the spinning blade of a rotary unit is still lethal if you don't respect it.

By ROBERT P. CROSSLEY

NEVER PULL A MOWER UPHILL as this homeowner is doing, because one slip and your foot could be under the housing and in contact with the rotary blade.



YOU'VE PLAYED THOSE PINBALL machines where a steel ball comes up out of a hole and gets flicked around by swinging paddles. Or those amusement-park games that toss baseballs at you to bat back.

Well, this was the busiest, bounciest pinball machine of all time—and the most deadly. Instead of smooth steel balls, it batted nice, friendly objects like nails, rusty screws and pieces of bent wire—the kind of junk that lurks in deep grass and even in the best-kept lawns.

The "bat" was the whirling blade of a 20-inch rotary mower, mounted over a base of hard plywood in the center of a "bulletproof," transparent box of ¼-inch Lexan plastic. The nails and screws and pieces of wire were "fired" upward through a steel pipe, to be sent hurtling against a backstop 40 inches behind the rear edge of the mower housing, which could be raised and lowered. There were foul balls, bouncers and home runs, depending on how solidly the spinning blade "connected" with each shrapnel-like projectile. A high-speed camera, mounted in the mower, recorded the trajectory of each.

This was not some fiendish toy, but a controlled experiment. It was set up by the University of Iowa's Institute of Agricultural Medicine, which has been studying rotary mower accidents for three years and trying to figure out how to prevent them. Its work has been supported by the U. S. Public Health Service and by the Outdoor Power Equipment Institute, whose "Safety Seal" program, announced earlier this year, included some of the University's recommendations, but, in the opinion of Prof. L. W. Knapp Jr., chief of the Institute of Agricultural Medicine's Accident Prevention Section, doesn't go far enough.

Prof. Knapp and W. H. McConnell Jr., an agricultural safety engineer, made an intensive study of 77 mower accidents in 1964. They talked to victims in six Iowa counties, interviewed their doctors, examined the mowers and the scene of the accident, took pictures of severed boots and toeless feet. It was a grisly business.

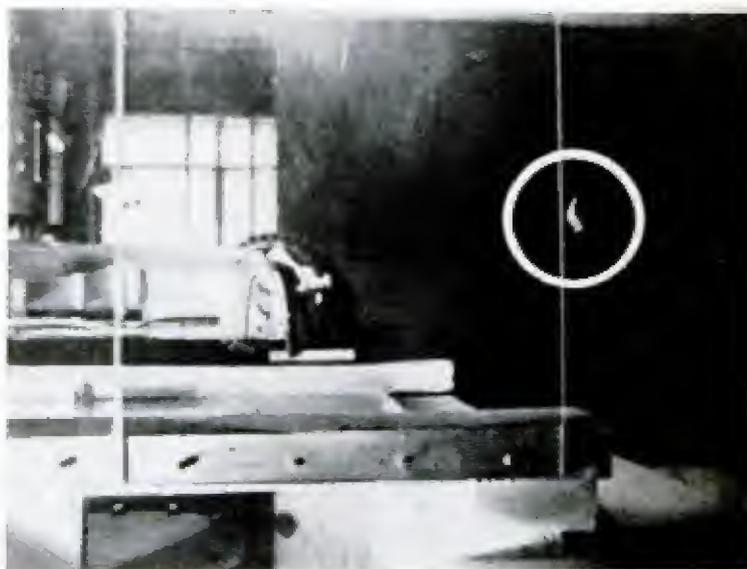
The doctors, accustomed to amputating arms caught in corn pickers, often rated the rotary mower the most dangerous machine that their patients—even farmers—had occasion to use. Some even say that

all rotary mowers should be outlawed.

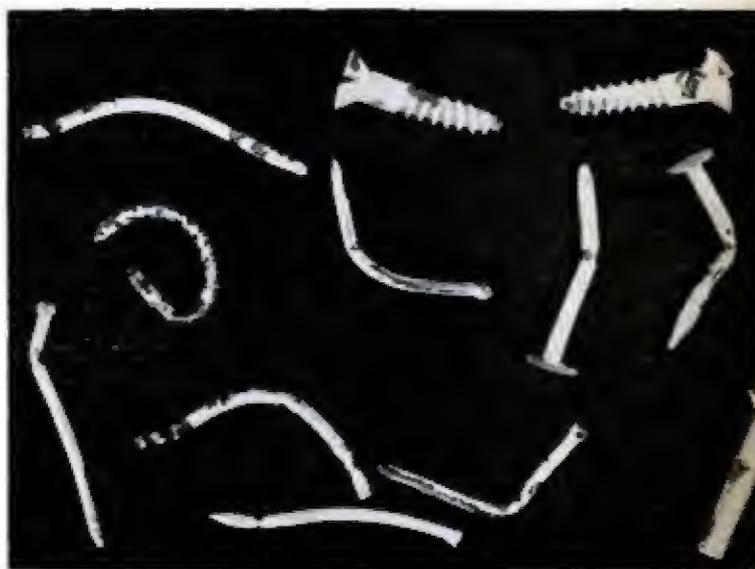
Prof. Knapp doesn't go *that* far. "Rotaries are an efficient way to cut your lawn and they *are* getting safer," he points out. "Safe, but not safe enough."

As the researchers studied mower accidents, some patterns began to emerge. Two out of three accidents involved the legs or feet. Four out of five happened with hand-propelled mowers, and seven out of ten of the mowers were less than three years old.

Of course, not all of the accidents could be blamed on the mowers. Some were due to plain carelessness like pulling the mower backwards over your toes. Prof. Knapp described these as "Man-Faults." Others were due to "Machine-Faults" like clumsy steering on a riding mower or



HIGH-SPEED PHOTOGRAPHY in laboratory test of rotary mower's lethal power shows a nail (circle) being thrown by the blade with the force of buckshot



INNOCENT-LOOKING screws, nails and pieces of wire were deadly projectiles that inflicted injury when they were picked up on lawn and thrown by mower

Things to look for . . .



SAFETY HANDLE cannot be pushed beyond stop without side pressure to release it, making it difficult for an operator accidentally to walk into mower



LOOK, MA, NO HANDS are used to clean this mower. Hole in this deck takes water from garden hose and flushes clippings out through vent in the side

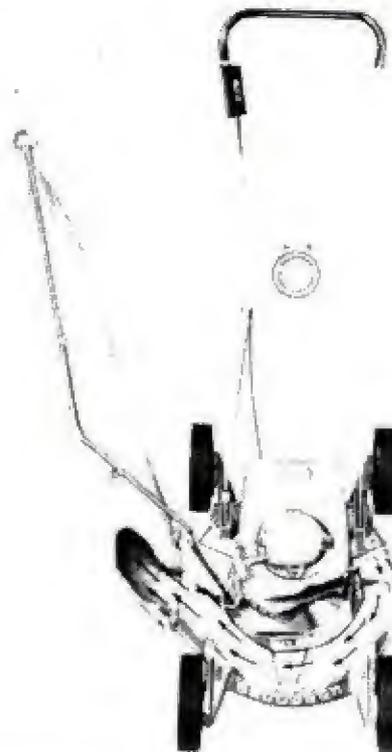
wheels that kept coming out of adjustment. Still a third group were blamed on "Environment-Faults" like rough ground or lethal objects in the grass. Prof. Knapp feels that a really safe mower should tend to prevent or overcome all three.

The accidents also seemed to sort themselves into five categories, regardless of who or what was to blame. The University labeled them "Thrown Objects," "Bystander," "Malfunction," "Unsafe Act" and "Non-Operational."

More victims were hit by thrown objects than were injured in all of the other ways put together. Most were hit below the knee while mowing straight ahead by objects



DANGER OF STANDING one foot on mower to pull the starter cord is eliminated by this crank handle that folds out of the way when it is not in use



HEAVY-DUTY GRASS CATCHER BAG with four-blade cutter helps to contain most foreign objects and is most effective when partially filled with clippings

shooting or ricocheting out from under the rear of the mower.

One victim was struck 9 inches up the side of his leg even though his mower had a side discharge. Whatever it was hit him so hard he fell to one knee.

"It felt like I had been hit by a hammer," he said. No one else was home, and he had trouble stopping the blood. He finally got to a doctor. The doctor probed the wound and, finding no object, dressed it and sewed it up.

Instead of healing, the leg swelled, and the pain got worse. He went to another doctor who put him in a hospital and took X-rays. They showed an inch-and-one-

half piece of wire imbedded three-fourths of an inch into the bone.

Wire is just about the most dangerous projectile. Rocks and similar objects usually bounce off, but wire will puncture the flesh and lodge there or in the bone. For that reason X-rays should always be taken when the skin has been broken by a thrown object.

You can get hit even on a riding mower. One operator was struck by an object that

was thrown out from under the mower and ricocheted off the steering mechanism.

You hear a lot about "Bystander Accidents." Though much rarer than injuries to the operator, they are the ones that get in the papers. A variation of the "Thrown Object," they can, of course, be quite serious. An Iowa boy was hit on the head by a rock. The mower that threw it was 55 feet away. He was standing on a bench,

(Please turn to page 188)

Things to avoid . . .



CARELESSNESS is a major accident cause, and a rotary mower that is left unattended for conversation is an irresistible attraction for small children



KEEP YOUR FEET OFF the housing when starting the mower and when it is running, and hands should never come in contact with engine in operation



DON'T PUSH THE MOWER UPHILL. Always mow slopes sideways and you eliminate danger of mower rolling back on your toes—and it's also less strenuous



NEVER REFUEL A HOT ENGINE, or the result may be a flash fire that could inflict serious burns or a sudden explosion that could easily maim or kill

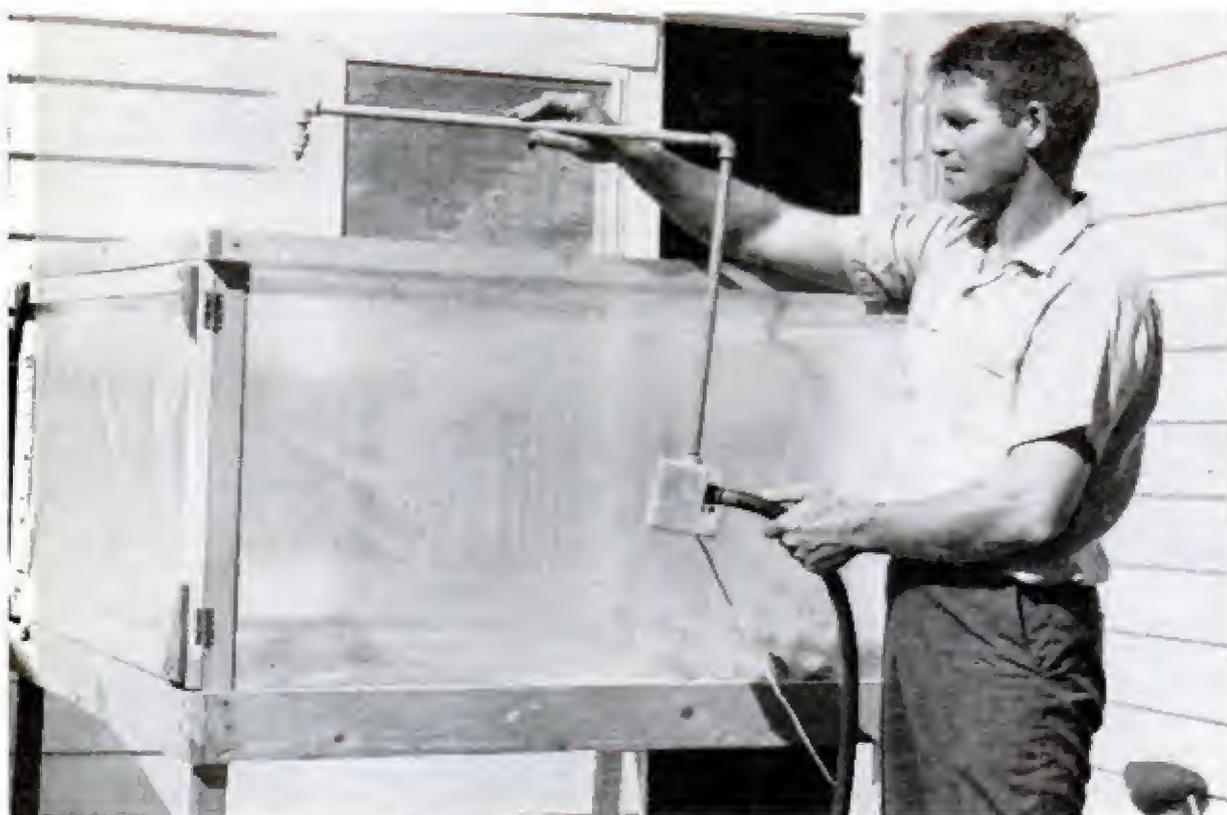


A CLOSE MANICURE is often the result of trying to unclog a running machine. This foolishness is the cause of two-thirds of the rotary mower accidents

Gardens for free

Bathe simple cuttings in electrically controlled mist, and presto—you have well-rooted plants and hedges

By KEN WARNER



GARDEN HOSE supplies the water for simple mist propagator. The water jet gives a fine spray like an atomizer for four seconds every minute, keeping the cuttings sufficiently wet throughout the day



HARDWARE CLOTH BASE insures drainage. Medium used here to make cuttings take root is perlite



ATOMIZING SPRAY HEAD delivers fine, even spray that keeps plants wet without soaking them

JET AGE GARDENING has arrived. With simple cuttings from a friend's garden and a system called mist propagation it is possible to have "instant" gardens at no cost.

Used by professional nurserymen for a long time, mist propagation has been limited by the cost of equipment. But now there are low-cost units available to the home gardener that will make a Luther Burbank out of any average "green thumb."

Originally called *constant mist*, mist propagation is the technique of bringing roots out of stem and leaf cuttings by keeping them moist, never letting them dry. The mist system works because it prevents the excessive loss of water by transpiration after a cutting is severed from the parent plant, thus making it possible for the cutting to grow new roots. The mist system is accomplished in nonsoil media, eliminating many insect and disease problems found in ordinary cutting beds.

Mist propagation is not a cure-all. Some plants, both herbaceous and woody, do not root well by this method. On the other hand, many hard-to-root cuttings root easily under mist. Rose and chrysanthemum cuttings 14 inches long are examples of plants that root easily. Cuttings too large for ordinary systems work fine under mist, thus providing a head start toward a larger plant.

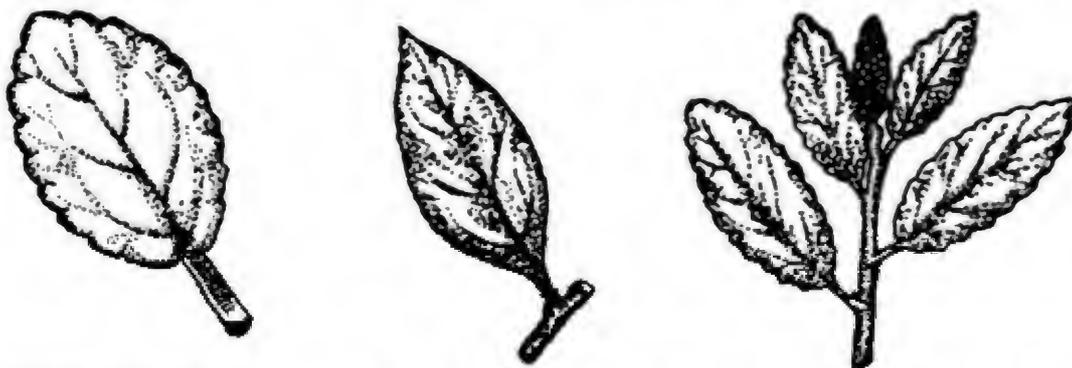
Misting at intervals is important for reasons of economy in water use. The technique requires only that the leaf surfaces remain damp to wet, as in early morning dew. Under most circumstances misting at night is not required, but in areas where the humidity is extremely low or where drying winds occur regularly, a night mist will be essential.

With one exception, the mist-propagating bed should be placed in direct sunlight. The exception is for cuttings from plants that require shade or that actually grew in shade. These should be misted in partial shade. But for all other plants the sunlight decreases the chance of plant disease and increases the rate of life processes.

The length or width of the propagation bed is dependent upon the individual operation, but it should be at least three-quarters of an inch deep and well-drained. The medium—the material used in place of soil—can be of several types, with fine gravel, perlite or wood shavings recommended for best results.

The actual process of making a setting is simple. An herbaceous cutting, such as chrysanthemum, is generally four inches or longer, with three or four sets of leaves. The lower leaf (or leaves) is removed and the cutting is set into the medium just deep enough to hold it upright. Deeper settings take longer to root. The mist is now applied to the setting until it takes root and is ready for trans-

You can use these three types of cuttings



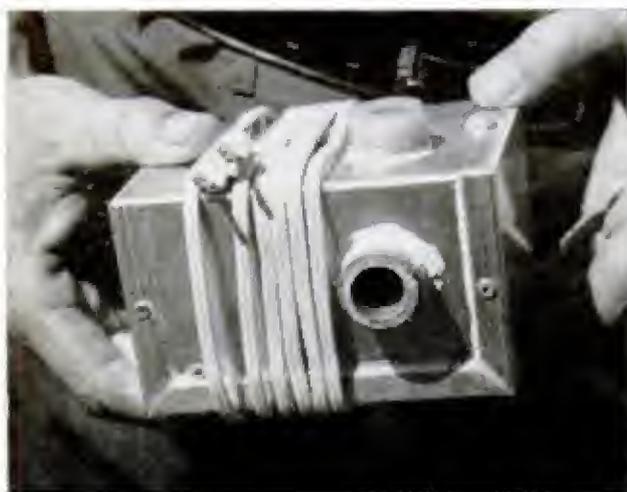
SIMPLE LEAF CUTTING (left), leaf bud (center) and herbaceous cutting will all take root



HEALTHY ROOT SYSTEM ready for transplant was grown on a hibiscus cutting in 60 days under the mist



POTTED FOR JUST THREE WEEKS after developing root system in propagation, plant is extremely strong



CONTROL UNIT for Mist Master shows the electrical connection, the inlets for hose and atomizer head

planting in the soil. The time necessary for growing roots varies with the species of plant. An hibiscus, for example, will take about 60 days to develop a strong growth of roots, but a box hedge would take considerably longer.

Leaf bud cuttings work with some plants. A leaf and its auxiliary bud (the bud that grows at the juncture of the leaf stem and the twig), plus a section of twig above and below the bud, are removed from the plant. These are placed in the propagation bed with the bud completely covered by the medium.

Leaf cuttings will also take root under a mist propagation system. Cuttings are made by taking the leaf blade and petiole (the slender stem that supports the blade of foliage leaf) only. The petiole is set three-quarters of an inch beneath the surface of the medium.

The big expense in a mist propagator has always been the regulatory device, the timer that keeps plants wet but does not allow them to become soaked and rot.

Automatic mist control

When this problem was attacked by John Strong of Sarasota, Fla., he came up with a control unit which he calls "Mist Master." Strong incorporated a timer, solenoid, filter and valve in one small sealed box, ran it 24 hours a day for six months, then applied for patent. His device sprays water for four seconds every minute. He also has a photoelectric control which automatically turns the unit on at sunrise and off at sunset.

"I can adjust this thing here at the bench to deliver a mist at any interval from one to 59 seconds in a minute," Strong explained. "I sell it as a sealed unit because that way I know it's my fault if anything goes wrong." Seeking a mist interval that would meet most climate situations, Strong settled for the four-second mist bursts for his "Mist Master" on the advice of university horticulture experts. For extremely dry climates he increases the length of the spray prior to sealing the control unit.

The basic "Mist Master" unit is priced at \$35 and is guaranteed for a year. The photocell control is an additional \$10. Strong also puts out a kit which includes all the necessary equipment for a propagator unit with the exception of wood frame, fasteners and hinges, and he has this priced at \$41. ★★★

Strange Berry Has a Flavor Secret



EAT ONE OF THESE olive-sized berries and it will make sour food taste sweet. "Magic" ingredient is found in the pulp, not in skin or dark, shiny pit



SINCE HE FOUND the first shrub four years ago, Bob Snow has collected a yard full of the plants. They're slow growers but reach height of 10 feet

EAT A LEMON and it tastes far sweeter than the ripest orange; bite into a sour pickle and you find your mouth filled with a taste of pleasant sweetness. These are tricks you can play on your palate if you first munch the pulp of a red berry from Africa called "miracle fruit."

For centuries, West Africans have used the berry, which grows on the shrub *synsepalum dulcificum*, to make their sour palm wine potable. About 100 years ago an English botanist recorded the unusual properties of the fruit. New interest in the plant was created four years ago when Bob Snow of Lakeland, Fla., came across a specimen in a Florida nursery. He soon sold his employer—International Minerals & Chemicals Corp.—on the idea of a research project.

IMC scientists learned a number of interesting things:

- Miracle fruit contains a substance that affects the taste-sensing organs, changing their response but not the flavor of the food.

- The effect lasts for about an hour. You have to chew the berry first; there is no taste-masking if pulp from the berry is merely mixed with other foods.

- Miracle fruit doesn't work on salty or bitter-tasting foods.

- It adds no calories to the food.

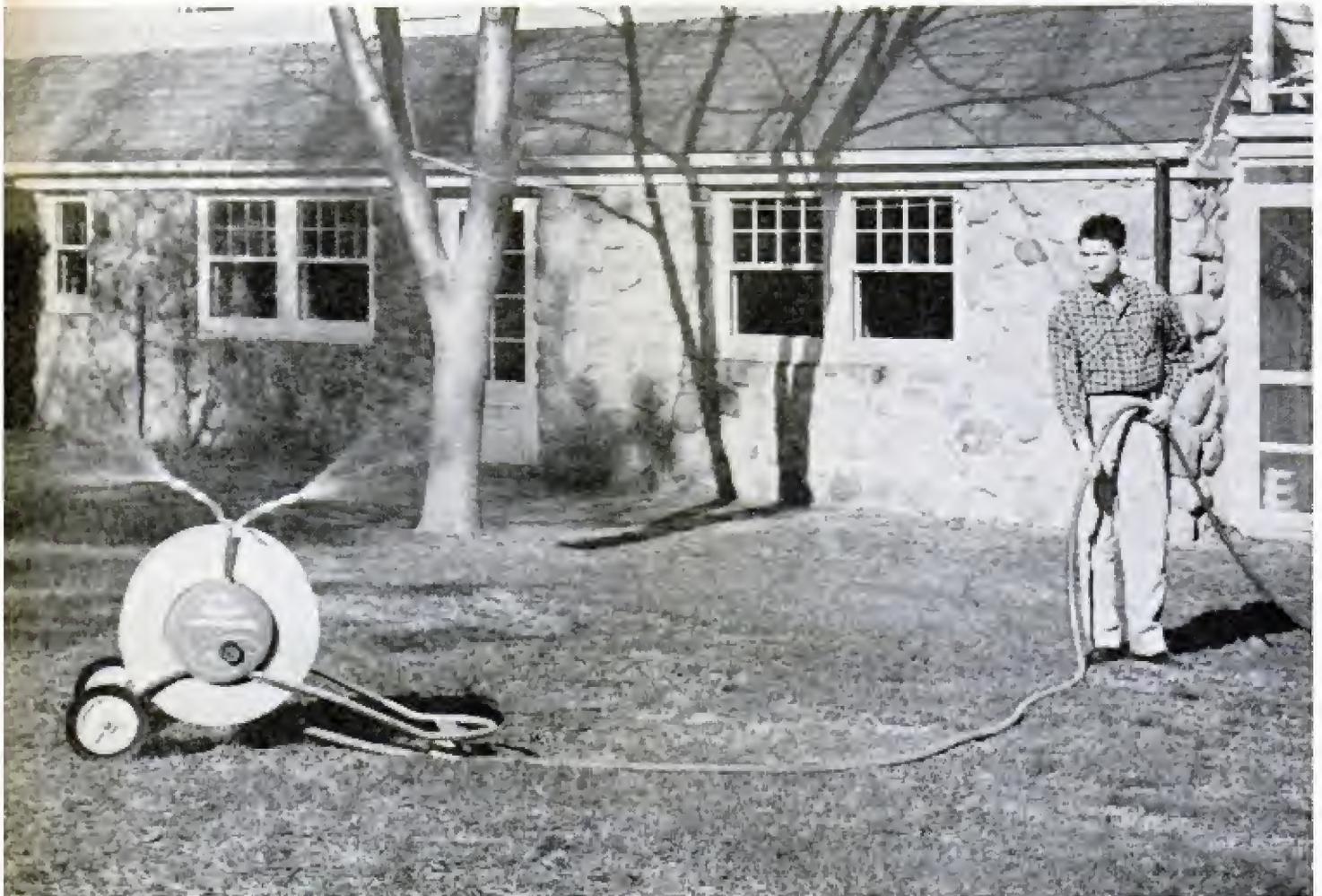
The one thing the researchers couldn't determine was how the strange berry works. They were unable to isolate the ingredient that so effectively confounds the taste buds.

But this failure in no way dampened their enthusiasm for the fruit itself. One of the chief investigators declared that the berry creates "a more desirable sweetness than any other." Its effect on strawberries, he said, was "out of this world," and it causes citrus fruits to become marvels of delicate flavor.

At present there seem to be no commercial applications for the berry. But if it ever gives up its secret to probing scientists, it could be a boon to diabetics and to weight-watchers who can't leave sweets alone.

★★★

BE LAZY ABOUT LAWN SPRINKLING



ROBOT REEL NOT ONLY SPRINKLES LAWN, but rolls up hose. You lay out hose in sprinkling pattern, then turn on water. The robot faithfully plods over lawn, slowly reeling in the hose. Finally, an automatic shutoff valve turns robot off. Sprinkler is made by Melnor Industries, Moonachie, N. J.

MOST GRASSES show remarkable tolerance to drought. Grasses may become brown and dormant if not watered, but generally they recover when the fall rains come."

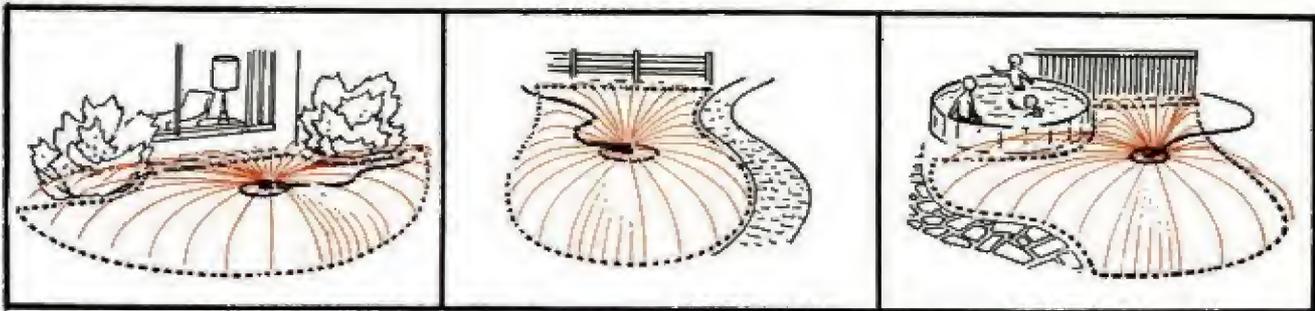
You'll find this observation in an authoritative volume, the *Yearbook of Agriculture*. The message is clear: If you have the necessary psychic stamina to look at a brown lawn all summer, you don't have to get into a sweat about watering.

But if you're like most of us, your conscience won't permit you to turn your back on that expanse out front that should be lush and green. The only way out for the average lazy gardener is to make the watering as automatic and self-

propelled as possible. That's what the equipment shown on these pages is all about. You'll find all kinds of labor-saving devices, including sprinklers with "brains," robot reels and automated systems. Let them do the work while you, your conscience clear as that of a baby, loll in the hammock.

All that's required is a modicum of planning and know-how. If you'd like a quick refresher course, here's some advice from Robert M. Hanna, a soil specialist at New Jersey's Rutgers University.

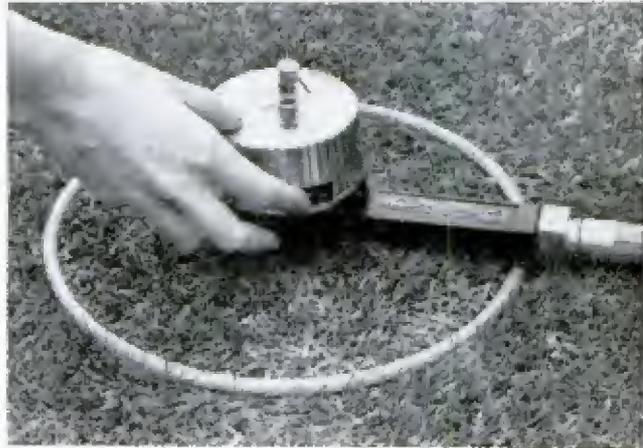
Some plants are more efficient users of soil water than others, explains Hanna. The greater the depth and density of roots, the greater the plant's ability to take up enough water to withstand the



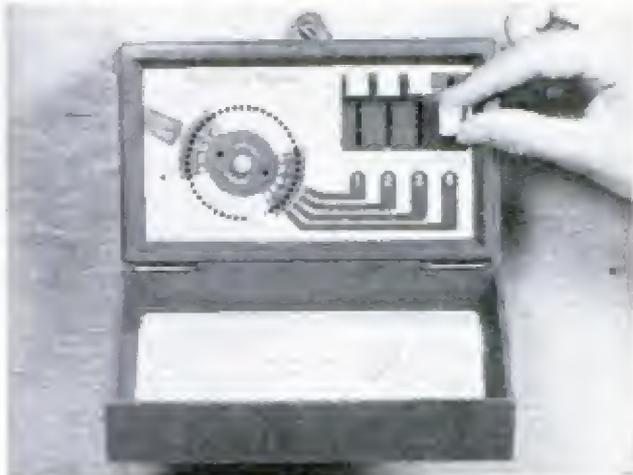
SPRINKLER WITH A BRAIN SPRAYS THE EXACT PATTERN of your lawn, no matter how irregularly shaped. You "program" 16 different adjustment knobs to the contour of your lawn. This permits you to avoid areas that you want to keep dry. Made by the Gates Rubber Co., Denver, Colo., gadget costs under \$20



HANDY WATER TIMER measures quantity of water flow and has automatic shut-off feature. It's made for Melnor sprinkler but will also work with other makes



SPRINKLER "REMEMBERS" PATTERN, once it's set. Substitute discs, quickly slipped into the Gates watering device, enable you to program several areas



TIMER YOU CAN PROGRAM to sprinkle any section of your lawn, day or night, is heart of the Toro system, which is sold in kit form at price of \$189.95



COVERAGE UP TO 8500 SQUARE FEET is provided by timer, sprinklers and flexible pipe in the basic Toro kit. Pipe is buried at a minimum depth of 4 inches



WAVE SPRINKLER in Toro underground layout throws water fan covering rectangular area of 2500 square feet. Sprinkler is installed flush with the ground



SLEEK CRAWLER moves across lawn by reeling up a metal tape. Dial permits adjustment of sprinkling path from 5 to 50 feet wide. Maker is Sunbeam Corp.



BLAST OF PLANT-TREATING CHEMICALS is applied with Aquablast. It has 30-gallon tank and a 1-hp electric motor to provide the power. Cost is \$595

effects of rapid water loss during very hot, dry weather. You encourage deep root growth by proper watering.

Frequency of watering is determined by the type of grass, the soil in which it grows, weather conditions and the availability of water. The type of soil may be the most important factor. Hanna recommends that you water a sandy soil every 5 to 8 days and a loamy soil every 7 to 10.

Normally, the root system goes down to about 12 inches. That means that watering should penetrate to a depth of at least 6 to 8 inches. If a lawn has regularly been given light waterings, the root system probably is shallow. That's a condition to be avoided. During a dry, hot spell the top inches of soil lose moisture



PRODUCING VARIETY OF SPRAYS are discs that slip into wand of the Aquablast, also used to wash cars, fences, buildings. Made by FMC Corp., San Diego, Cal.

first, leaving the root system high and dry.

"There are times when a light application is called for," the soil expert points out. "For instance, you don't want to put too much on when you have a new lawn. Then the root system is near the surface and only making use of an inch or two of soil." And when fertilizer is applied, it may be advisable to water lightly to get the fertilizer in solution and into the ground.

How do you determine how much water you've put on? Hanna advises adding a water timer to your garden equipment. Actually, a timer is a metering device that measures quantity of flow and is much more reliable than the practice of putting several empty coffee cans on



DIAL AMOUNT OF WATERING you want and timer does the rest, even compensating for changes in water pressure. It's easily installed on any sillcock



SQUARE-SHAPED HOSE is secret of new sprinkler system designed for foundation and border areas. Anchor spikes hold hose. It's sold by Sears, Roebuck



EASY AS PIE to hop over this exceptionally flat spray. Low angle of the Gates sprinkler eliminates windblown spray, permits watering under windows



TRENCH CUT FOR HOSE leads to stake, where sprinkler in Sears Sprinkler-Matic system will be installed. Single head can water area 80 feet in diameter

the lawn in order to measure the fall.

Hanna would like to dispel some of the incorrect notions people have about watering. Many gardeners think the evening is the best time to water. Wrong, says Hanna. Watering at that time of day increases chances of mold or a fungus to get started. The morning hours are, by far, the best. Early in the morning the temperature of the water and ground are very close. If you choose the hottest part of the day, on the other hand, there's danger of steaming or "cooking" the grass. It's also a good way to waste precious water.

Here are some other tips offered by the soil expert:

- Water your lawn at least once in mid-spring.

- For sandy soil, begin your regular watering schedule in early June; for loamy soil in mid-June. An exceptionally dry May calls for an earlier starting date in either case.

- Water lightly only after planting new seeds or when the weatherman predicts rain in a couple of days.

- Water "deep" most of the time, especially before going away for any extended period.

- The use of a hose instead of a sprinkler is the chief reason for underwatering, which is more harmful than overwatering. Use a sprinkler—it's much more efficient and helps eliminate wasted "runoff."

- Moisture in the soil makes fertilizers available to the plants. ★★★



ELECTRICALLY OPERATED CONTROL automatically opens and closes low-voltage valve assemblies at preset intervals. The control works on 110-120 volts



POP-UP HEADS are planted in holes 16 inches deep and held in place with coarse stone fill. When not in use, sprinkler head cover lies flush with ground



BUFORD MORGAN, who began his underwater farm about 15 years ago, is now No. 1 moss man in country, harvesting from 60,000 to 100,000 plants daily. And he sells all of them

Moss man from Missouri

His farm is under water and he never plants a crop, but the harvest rolls in every day of the year

By SHIRLEY ALTHOFF and DICK WEDDLE

AS A FARMER, Buford Morgan has it made. He specializes in a crop that requires little planting or cultivation and produces a harvest every day of the year. Neither drought nor flood nor heat nor cold affect its growth, and government subsidies or soil bank problems don't worry him one bit.

In case you think Morgan must live in an agricultural never-never land, he doesn't. His farm is quite real—but it's under water.

The crop he grows is moss—the feathery, fragile-looking plants that make aquariums seem more like home-sweet-home to millions of fish throughout the United States.

Buford Morgan is probably the largest underwater farmer in the country. Each year, some 35 to 40-million moss plants are shipped to wholesalers from "The Narrows," his aquatic farm in Oregon County, just seven miles from the Arkansas border in southern Missouri.

More than 10 varieties of moss grow in the four big springs that gush from the limestone cliffs on his 208 acres. They include the popular fern-like myriophyllum, which outsells all other kinds two to one; giant and dwarf anacharis, with their shiny, almost transparent leaves; ceratophyllum, which looks like a small spruce tree; and vallesneria, which

MOSS FARMER (right) wades through crop to harvest myriophyllum, shaking water from plants before loading in his boat. Cut year round, moss replenishes itself every three months



SPECIAL TOOL, butcher knife attached to long wooden handle, gathers moss between blades, then flips the plants over and cuts



AFTER CUTTING, moss is carried to "moss house" where it is sorted and packed. *Myriophyllum*, shown here, is the best seller





CUSTOMER ORDERS are prepared in moss house. Most customers have large standing orders with Morgan. One wholesaler buys 8000 dozen plants every week



MOSS ENDS UP in aquariums throughout nation, decorating both aquariums and homes. About 40 million of these fragile-looking plants are shipped yearly

resembles a small-scale iris or jonquil.

It was the lovely springs that attracted Morgan to the property in the first place. They pour 150 million gallons of water a day (enough for the daily needs of a city with approximately a half-million population) into the Eleven Point River.

Fifteen years ago, he came across the farm while on a hunting and fishing trip from his home in Chaffee, Mo., where he worked as a railroad brakeman. The wooded land slopes up sharply from the highway to a precipitous "hog-back" ridge, which gives the farm its name—"The Narrows." On top of the ridge, you can see the Eleven Point flowing south from one side and, only a short distance away on the other, you look down on the north-flowing Frederick Creek. The farm has a mile of frontage on both streams.

After close examination of the triangular acreage, Morgan decided he wanted to buy it. His late wife, Dorothea, agreed with him. (She died last year.)

"Then all we had to do," he recalls wryly, "is figure out how we could make a living here."

Learning that the former owners sold a little of the moss that abounded in the springs to a few local dealers, he explored the possibilities of expanding this business. Using his railroad pass, he traveled to various parts of the United States, talking to wholesalers of aquarium supplies. He found quite a demand for fresh, healthy water plants.

A compactly built, soft-spoken man with

bushy eyebrows and neatly clipped moustache, Buford Morgan began to educate himself on mosses. He read every book and pamphlet on plants he could get his hands on, and began to experiment with different cutting and packing techniques.

"Mostly, it was a case of just learning by doing," he admits with a grin.

For the first few years, he and his wife donned waders and worked right along with their crews. Moss farming was, and still is, a week-long, year-round operation.

"The spring water stays at 58° F. winter and summer," Morgan explains. "Actually, this has a temporizing effect on the air. In cold weather, you just add a few more warm clothes when you're wading."

In a few years, moss sales caught on.

"When we started out, we often worked as many as 10 people because our methods and system of operation were much cruder," Morgan points out. "But now things are pretty well organized and four full-time employees usually can handle things. As for me, I hardly do any more gathering. I just concentrate on business."

Each day, the men cut enough moss to fill standing orders and others that come in, averaging 60,000 to 100,000 plants daily. Wading in the springs, they use a Rube Goldberg-like tool—a sharp butcher knife attached to a long wooden handle. They gather a bunch of moss between the two handles and then deftly flip the blade over, cut the plants and pile them in a boat.

Mature moss lies on top of the water and the men harvest it in strips, generally

working from the mouth of a spring to its entrance into the river. Within three months after being cut, the moss replenishes itself and is ready for the harvesters again.

After it is cut, the moss is sorted and packed in the "moss house," a concrete block building. There, the workers check the plants, discarding those with buds (which means that growth has stopped) and clipping about eight inches from the tips of the others. These are bundled in groups of 13 and placed in wire-bound wood crates lined with damp newspapers.

"We always use a 'baker's dozen' count," says Morgan, "to give our customers a break, just in case a few of the plants don't make it through shipment."

The speedy quartet of employees can cut, sort and bundle 2000 dozen plants apiece during their usual working hours of 7:00 a.m. to 2:30 p.m.

When a crate is filled with 350 dozen plants, it is taken to a nearby walk-in cooler to await shipment. At the end of a day, Morgan or one of the men drives 20 miles to Thayer, Mo., to ship the crates.

To make sure the aquarium plants stay fresh in warm weather, an eight-pound block of ice is added to each crate. The moss farmer freezes his own ice in half-gallon milk cartons which he buys from youngsters in the area for 50 cents a dozen. He leaves the ice in the wax-coated carton and wraps it in an insulating layer of newspaper so it will last on long trips.

About 10 years ago, Morgan began experimenting with some of the more expensive species of moss—such as the attractive red ludwegia and snowflake-like fontanalis—planted in concrete tanks he built around the edge of the old mill pond at Morgan Spring. All of the species flourished but, even now, this more or less cultivated crop represents only about 10 percent of his business.

Morgan has no desire to expand. "I deal with about 30 wholesalers now," he says, "and I've got just about as much business as I can personally handle. Most of them have good-size standing orders. For instance, we send one fellow in Michigan 96,000 plants every week."

"No, I don't have an aquarium," Buford Morgan confesses somewhat shamefacedly. "I keep thinking about it but I've just never got around to doing anything about it. I guess you might say that I'm like the barber who always needs a haircut." ★ ★ ★



CERATOPHYLLUM, which looks like small spruce tree, is third-largest seller at Morgan farms, and is one of 10 varieties of moss to grow on his 208 acres



MYRIOPHYLLUM is best-selling and most abundant of Morgan's mosses. Popular fern-like plant outsells all other types by huge ratio of two to one



GIANT ANACHARIS, featuring shiny, transparent-appearing leaves, looks almost artificial. But it is second largest seller next to favorite myriophyllum



RED LUDWEGIA, deep maroon in color, is one of rare plants grown by Morgan. More expensive, it is grown in special tanks, sold to special customers

STR-R-R-ETCH TO A



Tycoons, oil sheiks and maharajas are sending their stock cars to a Chicago taffy-pull that tugs them to extravagant lengths. You, too, can have a baubled, bulletproof behemoth for \$15,000 plus.

By ARTHUR WHITMAN, photos—CURT GUNTHER

THE CAR IS A SHADE over 22 feet long, weighs just under three tons, and has a 462-cu.-in. V8 engine that develops 340 hp. Some versions are bulletproofed.

A tank? Not at all—just America's newest prestige car, the Lincoln Continental Executive Limousine, made in Chicago by the Lehmann-Peterson Coach Co., Inc., the only independent shop in the country that makes limousines on a production basis.

Cadillac makes limos on its own production lines, as do Germany's Mercedes and England's Rolls-Royce. Others are built on a one-shot basis, usually by ambulance makers and custom shops. Only Lehmann-Peterson is in the business of converting standard cars to limousines and selling them through dealers.

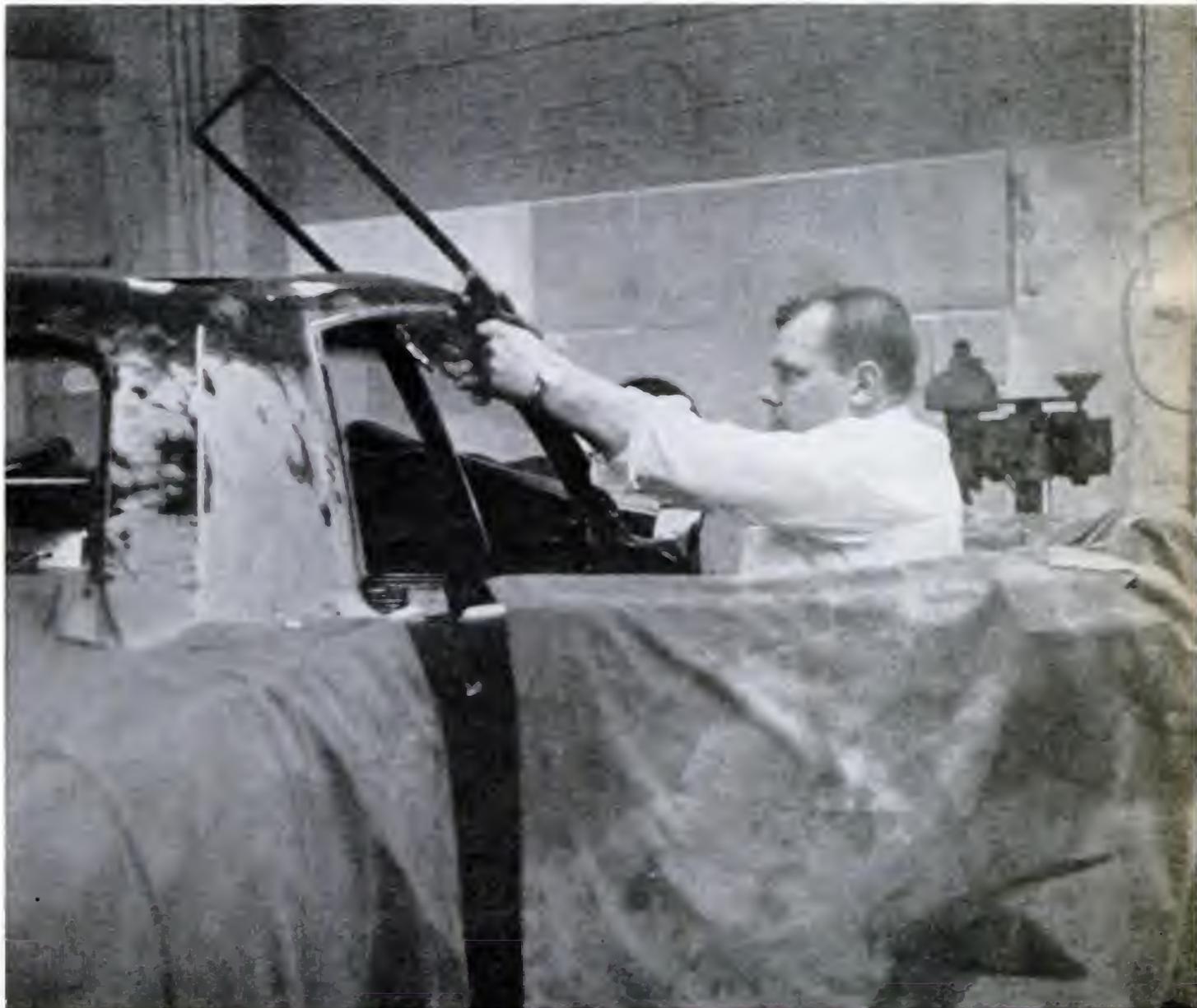
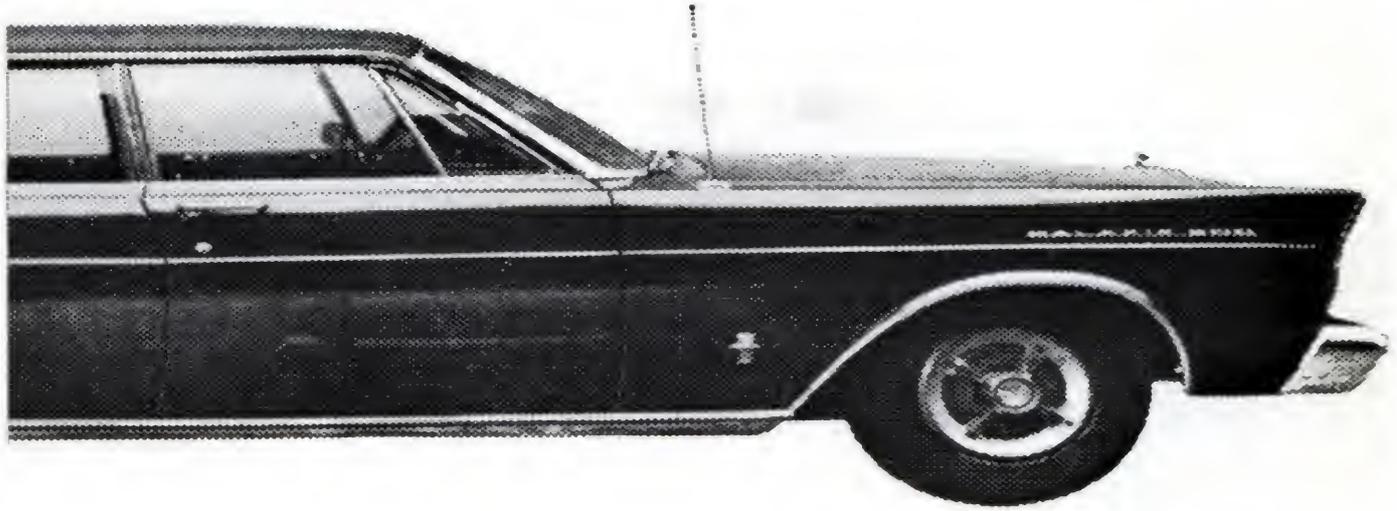
Among the firm's customers are Lyndon B. Johnson, the Queen of the Netherlands, Spain's Franco, UN Ambassador Arthur Goldberg, various oil sheiks and the U.S. Joint Chiefs-of-Staff. For every car made for a dignitary, five or so go to corporations who like their executives to travel in regal style. Some, like Ford, keep only a dignified one or two and use them mainly for important visitors. Others, like North American Aviation, keep a fleet of five.

Lehmann-Peterson also supplied the special car used by the Pope during his visit to this country in Nov. 1965. The car was made for testing by Lincoln in 1962, when the coachmakers first went into business. At the time of the Pope's visit it had been driven 170,000 miles. It was converted into a miniature throne room—complete with special screens, lights and a public address system—on eight days' notice and at a cost rumored to be in the neighborhood of \$25,000, paid by Catholic laymen's groups.

Curiously, few celebrities—as opposed to dignitaries—own the car.

"Jerry Lewis bought one of the first ones we made," says George Lehmann. "He seemed to love it for a few months, then got tired of it. We were delighted to buy it back from him. The car itself is our best ad, and with so few of them around at the time, we didn't want any of them trapped in garages. Since then we've learned that

LUXURY LIMOUSINE



CAR IS SAWED IN HALF just behind door posts, following stripping of interior and cutting away of rooftop
JUNE 1966

most show-biz and sports types are more interested in 'pizzaz' than dignity. We have quite a few cars in Hollywood now, but they're all owned by studios—Warner Brothers, Revue—who use them for VIP visitors. The stars seem to go in for hopped-up foreign jobs and sportsters."

The unique coach business started in 1962 when Lehmann, then 24, found himself fresh out of the Army and fresh into a substantial inheritance. "He had enough money so he could spend his life sitting on his duff," says an associate. But duff-sitting is clearly an unthinkable occupation for the peppery Lehmann. He has too much energy to sit still in his office for more than five minutes, even with the distractions of visitors, three telephones that never stop, a public address system for communicating instantly anywhere in the shop, and a six-inch stack of daily paperwork. This is on a slow day. Busy, it's exhausting just to think about him.

"I didn't know what I wanted to do," he says. "I love cars and wanted to get into the auto business. But how? What?"

In time, he met Robert Peterson. "Pete" was half-again his age and everything he is not—slow-moving, shirt-sleeved, relaxed, exuding equal parts of charm and torpor. The torpor is deceptive, though. An auto designer and industrial dabbler, he has spent most of his life building up businesses and then selling them out.

New market

When he met Lehmann, Peterson had just sold a successful propane gas supply business that had begun to bore him. He had long been thinking there was room in the auto business for newcomers, and he thought he knew just where it was—making limousines for the affluent and burgeoning executive market.

After preliminary talk and planning, the two decided they could hardly manufacture and distribute a car from scratch, but that they certainly could convert existing cars—stretching them to limousine size. They approached Ford, whose Lincoln-Mercury Div. produces some 14,000 Lincoln Continentals a year, but stopped making limousines in the 1920s. They offered to convert the conventionally luxurious Lincoln into an even more opulent car, providing Lincoln would sell them through its dealers.

The Lincoln people thought this might make some sense, but only if George and

Pete could meet and maintain engineering standards. They ordered two cars made and test drove them for 100,000 miles each. The cars held up beautifully—one of them, as we've pointed out, still in good enough shape to have been converted for use by the Pope—and tiny, newborn Lehmann-Peterson Coach Co. found itself closely affiliated with one of the world's largest corporations.

To fill dealer orders, Lincoln sends L-P standard "unibody" production cars, equipped with a limousine conversion kit. The kit consists of heavy-duty springs, shock absorbers and tires, an extra air-conditioning system and an outsized cooling system. The extra cooling power keeps the cars from overheating when they spend long hours idling while waiting for passengers, as many limousines do.

Sliced in two

L-P strips the Continental's interior, removes the rooftop and cuts the car in half at the doorposts. Thirty-four-inch steel panels are inserted to "stretch" the rear compartment, and new floor pans are welded in to compensate for the added length. The roof is replaced and covered with padded vinyl. The only important mechanical change is the installation of a new, elongated driveshaft.

Standard trim and fittings include a chauffeur's compartment, a rear compartment containing five seats, the biggest armrest in creation and an AM-FM hi-fi rig supported on a walnut liquor cabinet. Also standard is an umbrella, thoughtfully tucked under the front seat so that passengers are never inconvenienced by the weather. Even better, it's the chauffeur, of course, who has to remember not to leave it behind someplace.

Extras include a remote-control system to signal the chauffeur that His Nibs is ready for a spin, intercoms, full-scale public address systems, and just about any gingerbread the customer wants.

"We can do anything to either the interior or the exterior," explains Peterson, who does all the designing on the cars. "The only qualifications are that the customer wants it, can pay for it and that Ford doesn't find it offensive."

Pretty Jazzy

So far, inoffensive, paid-for modifications have included oversized trunks with *(Please turn to page 185)*



ROUGH EDGES are carefully removed, all gaps filled to assure flawless fit of finished limo's vinyl top



PADDED ROOFTOP is elegant feature of all Lehmann-Peterson conversions and typical of coachmaker's art



OUTSIZE RADIATOR core is part of heavy-duty cooling system, needed because limos often "stand and wait"

Old lawnmower provides GARDEN MULCH

By Manly Banister

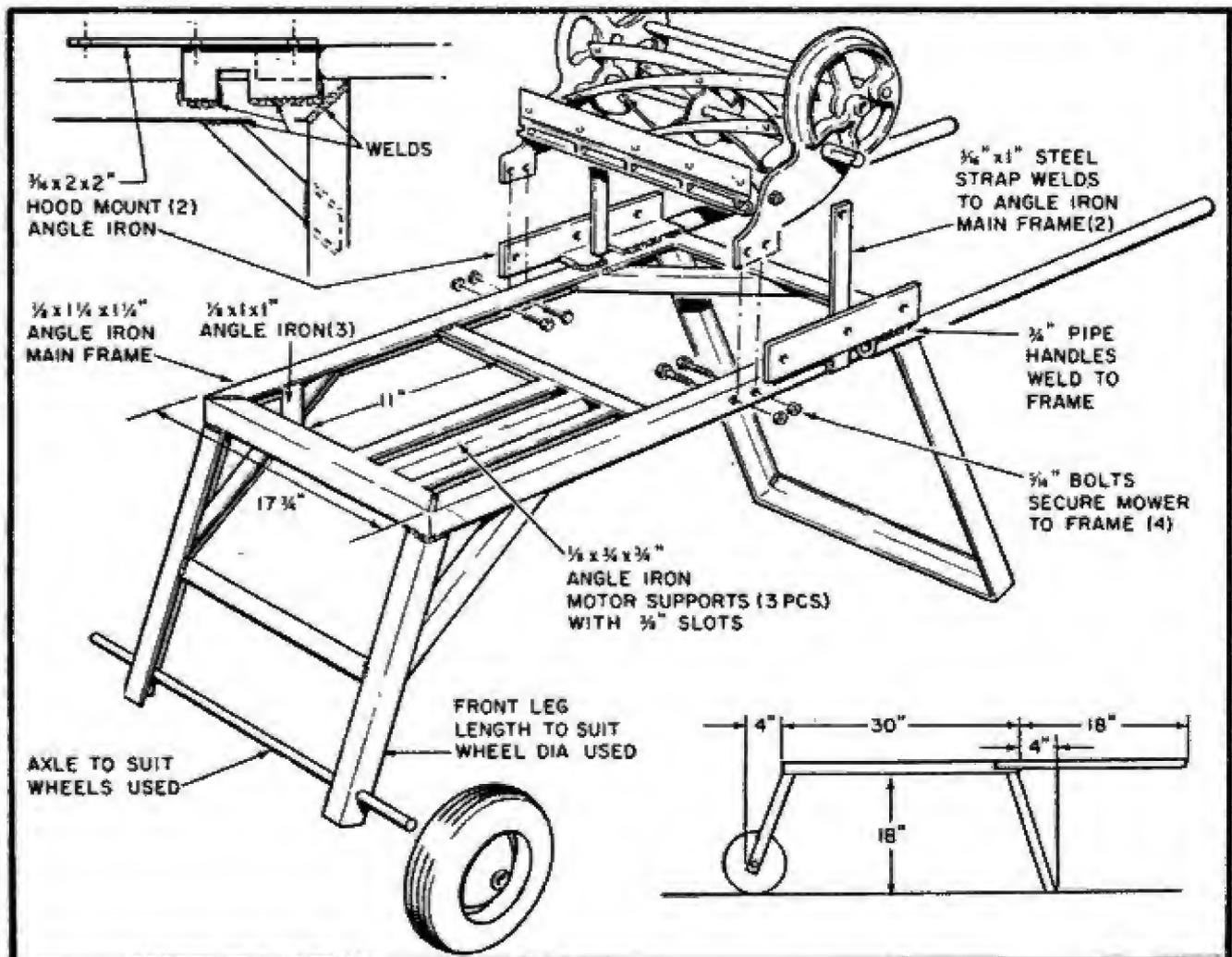
ANY GARDENING BUFF knows the best way to fertilize the garden is with organic material and that the cheapest organic material is home-grown compost. Mulches for the garden also come dearly and you're tossing out valuable humus by setting out your clippings at the curb.

Now you can build this mulchmaker to help turn grass clippings, leaves and non-seed-bearing weeds into valuable compost or mulch. What the machine will do for you is shred the material, permitting a more thorough mixing of compost activators with the refuse, speeding its decay into compost, and making compost or mulch easier to shovel and spread.

You can make this mulchmaker from a 16-in. hand lawnmower and a 3-hp gasoline engine or a 1 to 1½-hp electric motor. The first job is to strip the lawn-

mower of its handle, wheels and roller. Remove and discard the gears on the reel shaft. Follow the dimensions shown in the illustrations below if a 16-in. mower is used. The width would have to be varied for any other size mower.

Cut mitered notches at the corners of the angle irons to be used for the carriage frame and cut the other pieces to length. Bend the mitered areas into sharp corners and clamp to a welding table or to scrap plywood insulated from the table you're working on. This will prevent warping of the frame from the welding heat. Clamp the other pieces of the leg assemblies, corner braces, motor mount, mower supports and hood lugs and the pipe handles and weld them. All welds are made on the underside of the frame wherever possible.



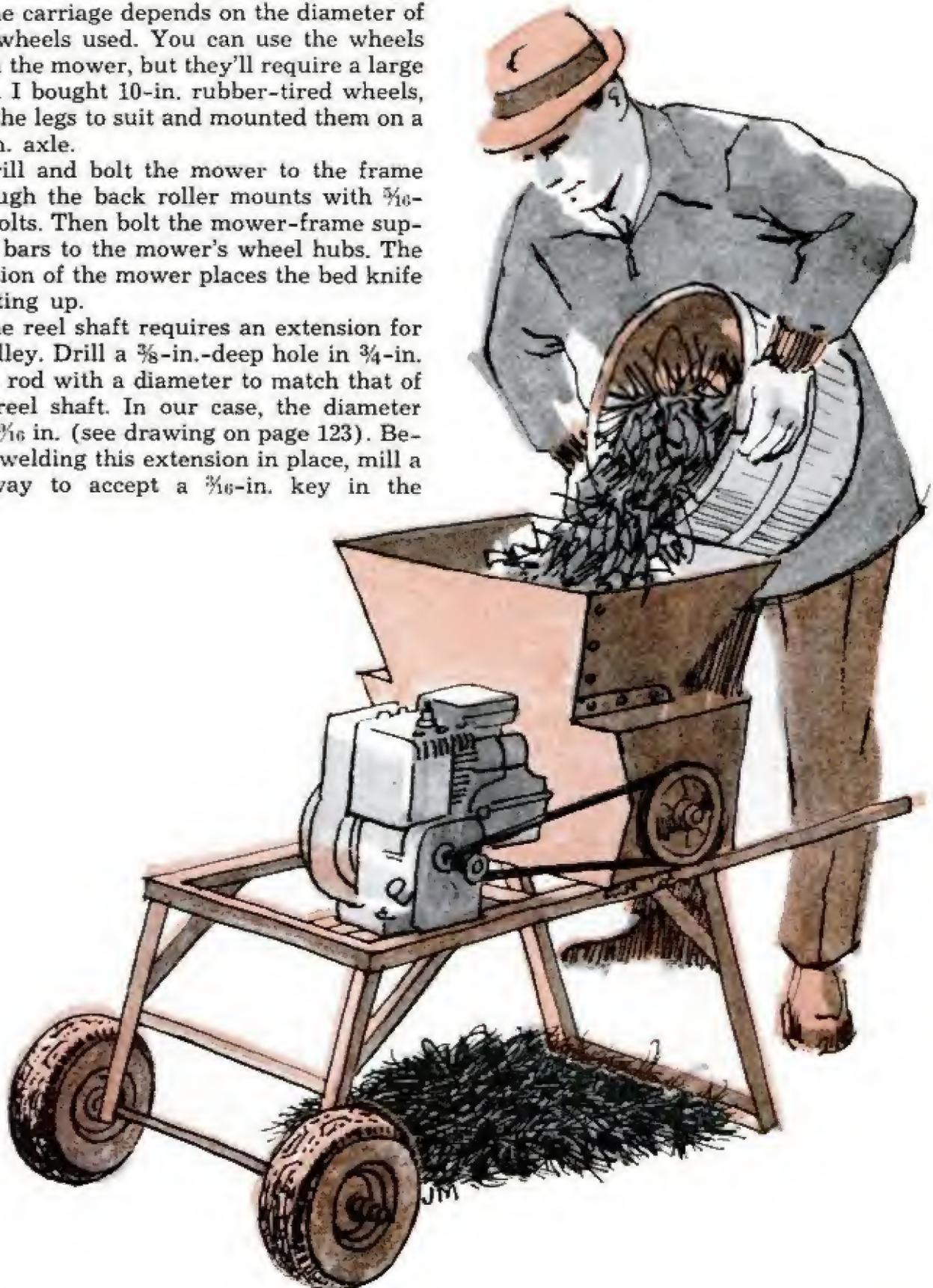
cutter for this

MAKING MACHINE

The lengths of the legs and the height of the carriage depends on the diameter of the wheels used. You can use the wheels from the mower, but they'll require a large axle. I bought 10-in. rubber-tired wheels, cut the legs to suit and mounted them on a $\frac{1}{2}$ -in. axle.

Drill and bolt the mower to the frame through the back roller mounts with $\frac{3}{16}$ -in. bolts. Then bolt the mower-frame support bars to the mower's wheel hubs. The position of the mower places the bed knife pointing up.

The reel shaft requires an extension for a pulley. Drill a $\frac{3}{8}$ -in.-deep hole in $\frac{3}{4}$ -in. steel rod with a diameter to match that of the reel shaft. In our case, the diameter was $\frac{1}{16}$ in. (see drawing on page 123). Before welding this extension in place, mill a keyway to accept a $\frac{3}{16}$ -in. key in the



CUT,
FOLD,
TAPE

MULCH MACHINE



STURDY CARRIAGE for the mulchmaker is completely welded. The board to which the frame is clamped to prevent warping is insulated from the table for safety. In this position, most welds are concealed

pulley, or file a $\frac{1}{16}$ -in. flat to take a set-screw.

The sheet-metal work comes next. About as thick a sheet metal as could be readily worked and bent by hand was selected—24-ga. galvanized. All the bends can be made easily by clamping the work between two boards or between a board and a table edge. A 2 x 4 with a beveled edge of the required angle will handle other than right-angle bends.

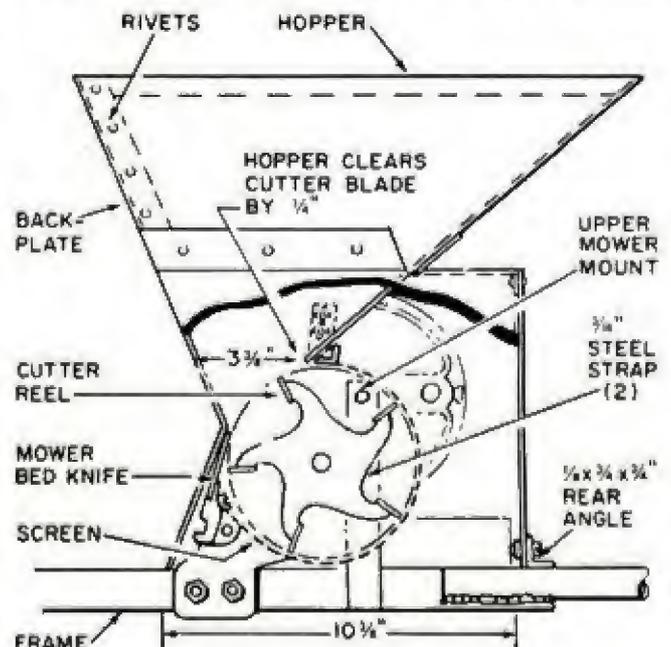
Lay out the patterns on the sheet, as shown on the facing page, indicating the junction of lines with a punch mark. Then you can lay a straightedge across the marks and scribe the bending or cutting lines.

Note that some of the tabs are for riveting and some are hems to be folded flat to avoid sharp exposed edges. The sides of the hopper are canted 17° and its back-plate is inclined 45° . This assures an even feed and a wide enough opening.

Clamp the hood to the hood lugs with C-clamps, then punch and drill for the retaining bolts. Three $\frac{1}{4}$ -in. stove bolts on each side and, later, two through the back-plate and the angle iron welded to the rear of the carriage, will be enough. When you have the hood bolted in place, cut the backplate to size and clamp it on. Drill No. 30 or $\frac{1}{8}$ -in. holes and secure it to

the hood with short Pop rivets spaced 2 to 3 in. apart.

Transfer the pattern for the hopper to a sheet measuring $18\frac{1}{2} \times 41$ in., as shown on page 124. You can work from the linear measurements without having to measure any angles. Install the three-sided part of the hopper carefully, making sure that it goes into place square and will clear the reel blades by about $\frac{1}{4}$ in. Clamp it to the hood tabs; punch, drill and secure it with Pop rivets. Cut the hopper backplate, bend



the tabs, clamp it and rivet it into place.

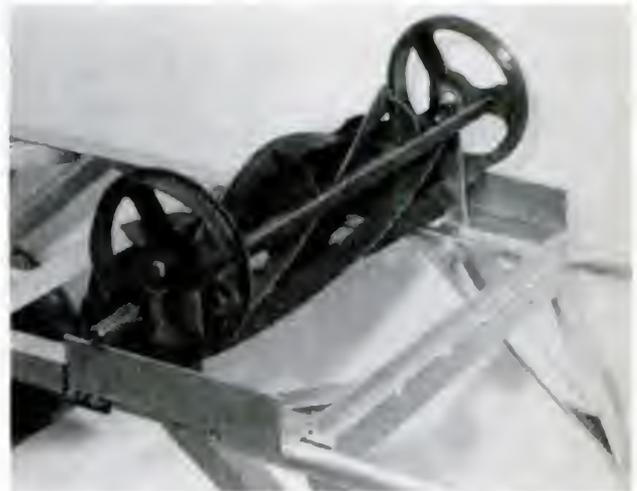
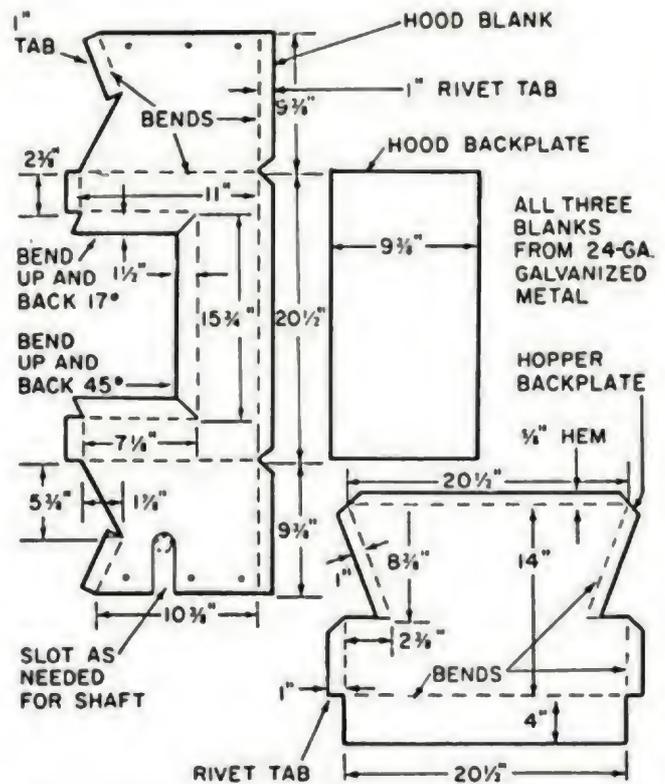
The screen you install next holds back the material fed into the machine so it can be ground finer and provides a guard under the cutter blades. With a crayon, mark the uppermost reel blade in such a position as to indicate just where the rear edge of the hopper opening is. A properly adjusted bedknife will help insure this. Then remove the hood-and-hopper assembly.

Obtain a piece of 1/2-in. 18-ga. rolled expanded-metal screen (preferably heavier) 16 in. long and as wide as the mower bed—16 1/4 in. in this case. Pass it over the reel, under the mower bar and keep it close around and under the reel. Then bring it up inside and snug against the bed. Drill for 1/4 x 3/4-in. stove bolts at the ends of the bed where they will not interfere with the reel, and attach the screening.

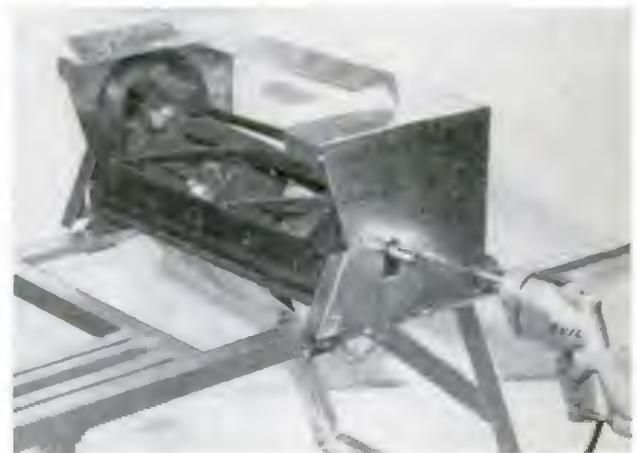
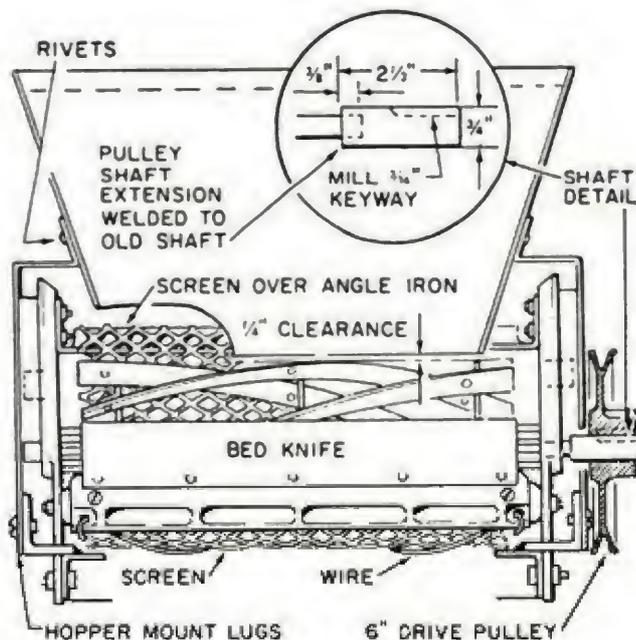
If you have difficulty in finding expanded metal screen, make your own by drilling 1/4-in. to 3/8-in. holes in a screen pattern in 16-ga. or heavier sheet metal.

Now, cut away one side of the angle of 1/8 x 3/4 x 3/4-in. angle iron to fit between the wheel frames so that there is a tab 1 1/2 in. wider at each end. Bend these up at right angles and then place the angle iron on top of the screen, positioning its front edge just behind the crayon mark so the screen will not be in the way of the hopper opening. Finally, clamp it to the wheel-frame spokes.

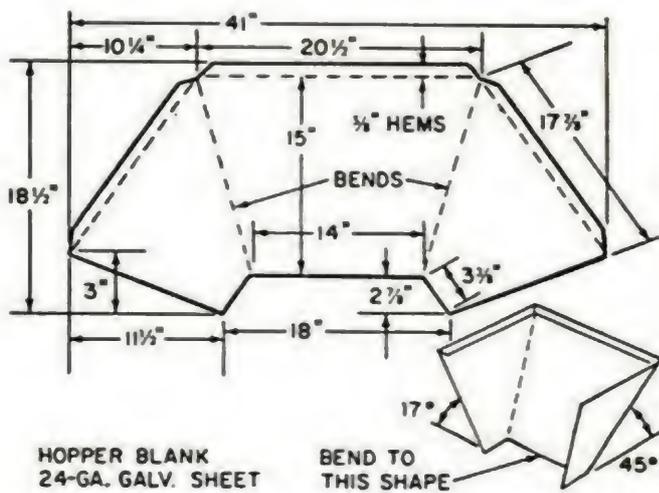
Pull the screen up tight and bend it back over the angle iron. Reinstall the hopper to check for fit, then remove it



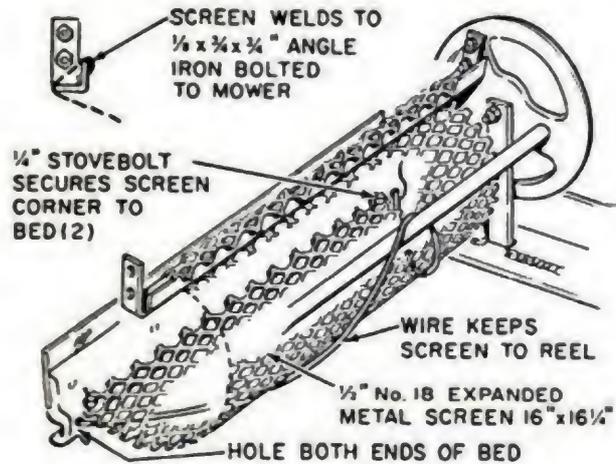
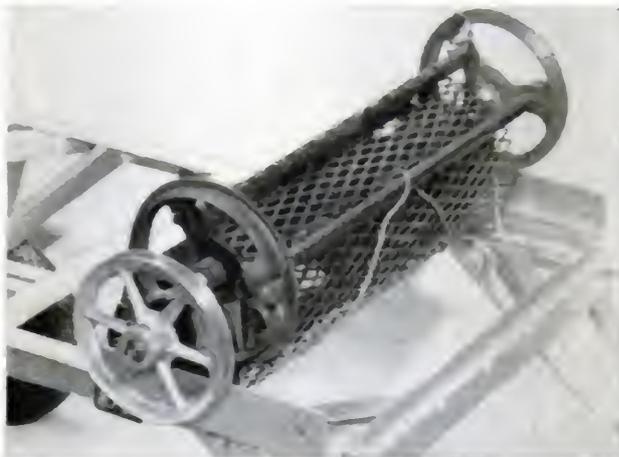
MOUNTED MOWER is attached on both sides through rear roller brackets to the carriage forward of the hood-support lugs, and to welded-on bars that are bolted through the hubs of the mower's wheel frames



MULCHER HOOD is clamped in position and holes drilled through it and the welded hood lugs. Protruding from the side is not the reel shaft, but the extension to hold the pulley outside the hood



COMPLETED HOOD-AND-HOPPER ASSEMBLY is riveted throughout. Note that the tabs of the hopper's upper edge are folded flat to eliminate sharp edges. Three sides of the hopper blank are cut from one sheet



SCREENED REEL produces finer mulch and covers the whirling blades underneath. With the help of the retaining wire, the screen is a close fit upon the reel and functions as myriad additional bed knives

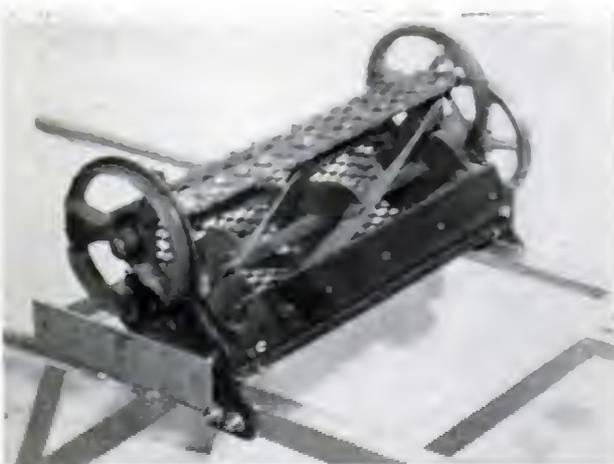
again. Spot-weld the screen to the leading edge of the angle iron, using a 1/16-in. or 3/32-in. welding rod and the lowest possible amperage.

Finally, pass the screen-retaining wire around the mower bar, as indicated in

the illustrations above. The ends of this wire, which should be stiff and heavy, are hooked through 1/4-in. holes drilled in the lower ends of the mower bed. Draw the wire tight to take up slack and sag in the screen, but make sure the reel can just rotate. After adjusting the screen for proper fit, reclamp the angle iron to the spokes of the wheel frames. Drill through for two 1/4-in. bolts on each end.

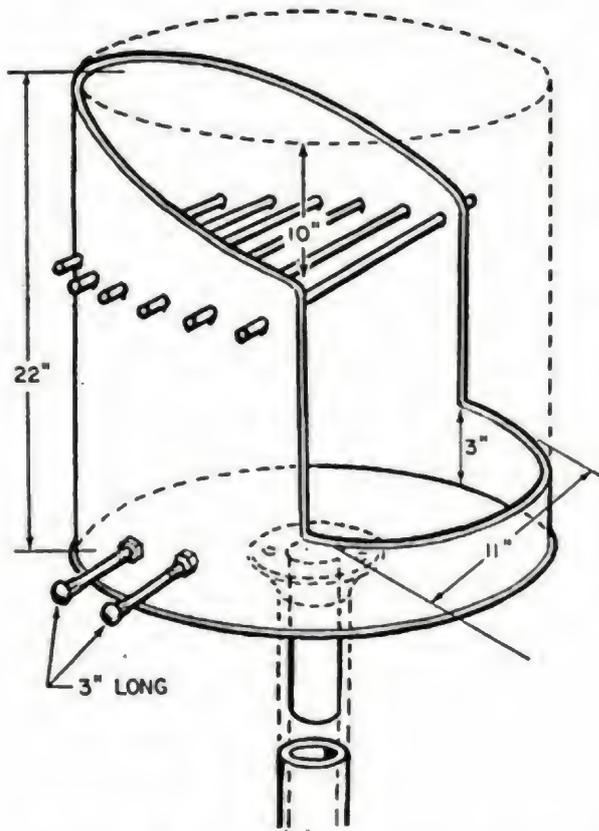
Replace and bolt on the hood-hopper assembly; install the engine or motor, proper size pulleys for 1200 rpm and the belt. The job is done.

There's a right way and a wrong way to handle the mulchmaker. Feed material slowly. If the reel jams, the belt will slip, but shut off the engine before freeing it by pulling the reel pulley backwards. Don't decrease the reel pulley's size to increase the speed or you'll burn out your bearings. And if children are around, it would be wise to make a belt and pulley guard out of sheet metal. ★ ★ ★



FRONT VIEW OF SCREENED REEL shows screen mounting bolts, looped ends of the retaining wire and the mounting of the angle-iron bar at the screen's top

Drum up this lazy-susan brazier for backyard cookouts



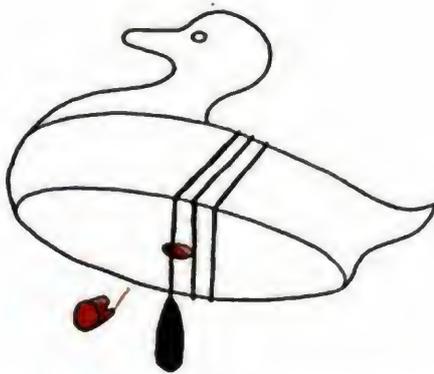
When barbecuing, you want the scent of steak to waft past your nose—not smoke. This convenient and easy-to-build Texas-style brazier can be turned to block the wind, and emptied easily by lifting off.

First, thoroughly clean out the interior of a 32-gallon steel drum. Then, using chalk, mark the drum for cutting with a hacksaw. Bolt a pipe flange to its bottom to take

a 1½-in. x 1-ft. pipe which will fit inside a 2-in. x 4½-ft. pipe anchored in concrete poured in a 6-in. x 1½-ft.-deep hole.

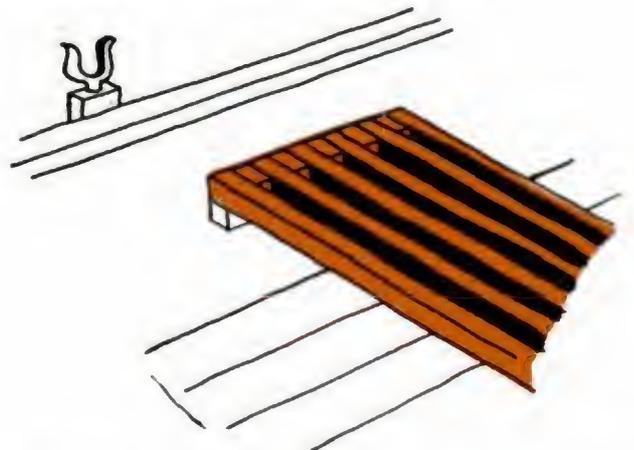
Drill six opposing ½-in. holes on each side of the drum and 10 in. above the bottom for ½-in. steel rods to form a grill. Cut the rods 2-in. wider than the drum. Near the bottom, drill for 3-in. bolts to hold your utensils.—*John Blaine*

Decoy stows its anchor



Why spend half your hunting day un-snarling duck-decoy anchor lines. You can carry them neatly by drilling the bottoms to fit a cork. Wrap the line around a decoy and pinch it in the hole with a cork notched near the small end.

Slatted seat stays dry



Your rowboat seats will dry faster after a shower and you won't slide when rowing if you make them slatted from ¾ x 1-in. lumber. Use ¼-in. spacer blocks at each end and nail each slat to each spacer as you go.—*G. E. Hendrickson*



Keeping electric garden tools cutting

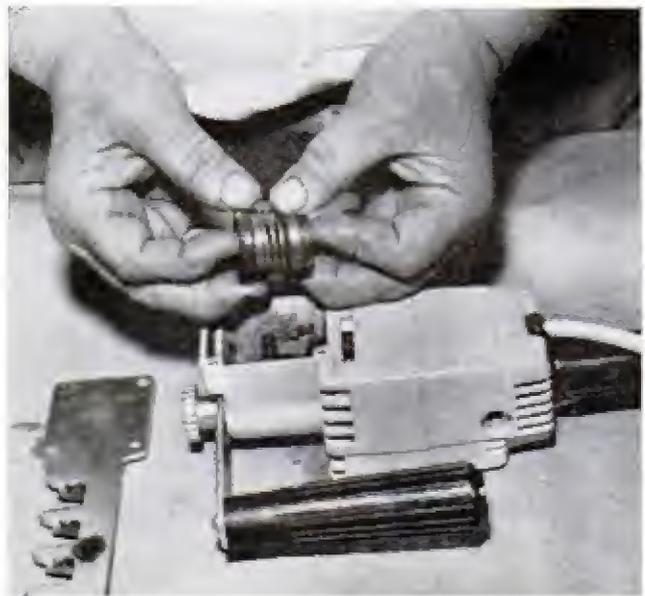
Now's the time to get these power garden tools in shape; cleaning, lubricating and perhaps a couple of new brushes are usually all it takes.

By Steven J. Howard

BRUSHES ARE REACHED for inspection or renewal by removing access screws in motor housing of the tool



FRICITION CLUTCH—it's a coil spring around a split gear—helps prevent motor burnout and blade damage



POWERWISE, all electrical power garden tools are pretty much the same. Hedge trimmers, grass shears, edgers and cultivators all get their get-up-and-go from the same type of booster—invariably a small, compact universal motor rated at 115 v., 60 cycles and around 2.5 amps. It is usually only the gear arrangements of these tools which may differ slightly from brand to brand.

Some garden tools are direct-drive units in which the spinning armature drives the gears which activate the cutting blades. Other units incorporate a friction-type clutch—essentially a heavy coil spring positioned between a split gear. A clutch saves wear and tear on a tool by reducing the possibility of blade damage in permitting the blade to slip when it hits an obstruction.

Maintenance procedures for both types are essentially the same, except the coil spring of the clutch type must be checked for tension.

In tackling this seasonal maintenance and repair chore, stick to the procedure outlined below. During disassembly, lay out the parts neatly and in sequence to facilitate reassembly after servicing.

It has been found that over 90 percent of all troubles that develop in these tools

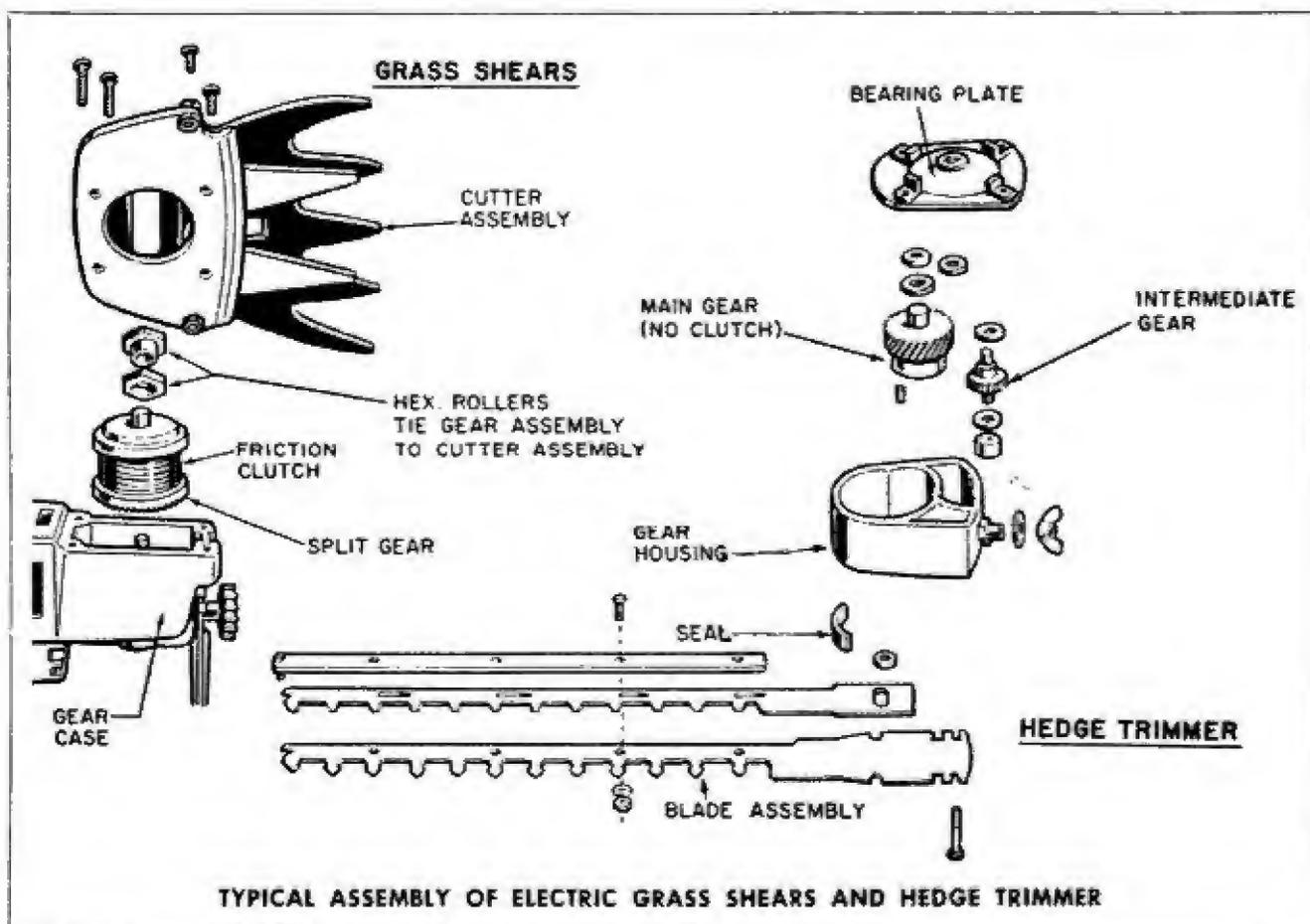
originate either with the commutator part of the armature or with the brushes. These components should be checked first.

Plug in the tool and run it for a few minutes. Does it operate normally? Fine! In that case all you'll have to do is check the brushes to make sure they're in good enough shape to make it through the summer. You should also lubricate the gears, and perhaps sharpen the cutting blade.

Most of these tools have two access screws which enable you to take out the brushes without dismantling the unit. To check the commutator and brushes of units not having access screws, you'll have to remove the tool's rear cover. Also, though only one brush may be badly worn, both brushes should be replaced with new ones. Any brush less than $\frac{3}{16}$ in. long should be replaced. New brushes run about 35 cents each.

Run the tool with the cover off to make sure the brushes are making full contact with the commutator. If they are, you'll probably be able to see a fine line of arcing between commutator and brushes. Poor contact will show up as bright sparks or blue streaks jumping from brushes to commutator.

If arcing occurs even though the brushes

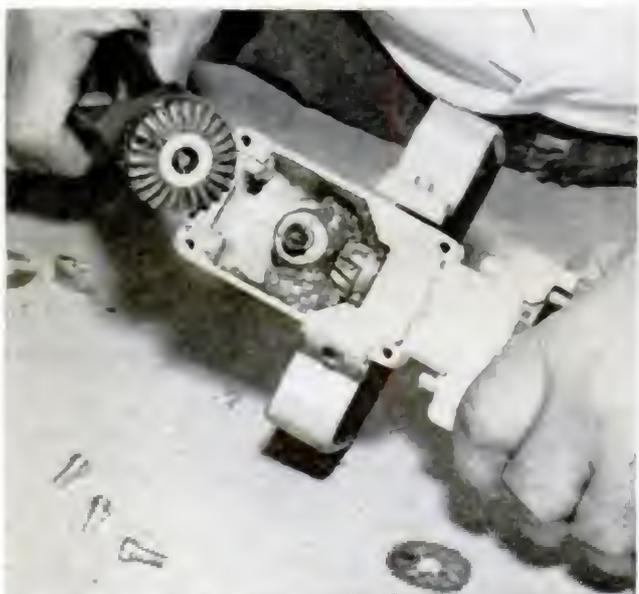




TO SERVICE THE ARMATURE, separate the motor housing by removing the screws which join its two parts



EXAMINE ARMATURE and commutator for dirt and melted solder. Note small fan which cools motor



DIRECT-DRIVE TOOL uses no friction clutch; a main gear meshes with drive gear to operate cutting blade

are okay, you've probably got a damaged commutator. Check it carefully. Revolve it by hand and inspect it for rough spots and dirt. If you find any, smooth the commutator with a few *light* strokes of No. 3/0 (or finer) sandpaper. Then try wiggling the commutator segments with your finger. All should be tight. If any are loose, replace the armature.

Check it too for burned spots, and be sure the spacing between segments is uniform. If some spaces are irregularly wide, the armature should be replaced. New armatures sell for about \$6 or \$7.

To replace an armature, first remove the tool's blade. Then pull the gear case away from the main case. The armature is attached to the gear case cover with the geared end of the armature shaft protruding into the case and meshing with the drive gears there.

You will note that the armature is held to the gear case cover by a small grease seal which fits around the geared end of the armature shaft. This seal prevents the lubricant in the gear case from entering the armature case. Remove the seal. If it is damaged—cut or flattened, for example—replace it (you can order a new one from the dealer in your area who sells your make of tool). With the seal removed, the armature can then be replaced.

When positioning the old brushes against a new armature, be sure the curvature at their ends matches the curvature of the commutator. In other words, reinstall each brush in the same position it had formerly.

The use of new brushes will sometimes prevent good electrical contact and less-than-perfect tool performance until they wear into place around the commutator. This wearing-in process can be hastened by applying an abrasive called brush-seating stick compound to the commutator while it is spinning. The stuff can be purchased at any auto supply store.

Maintenance of the gear case involves cleaning out old lubricant and replacing it with new. If you replaced the armature, the gear case is already open. If you didn't replace the armature, you still needn't rip the tool apart to get to the gears. Usually, removing the blade opens up the gear-case housing. In some tools the gears are reached by removing an access plate.

Clean out old lubricant with kerosene. Inspect all gears for broken or chipped

teeth and replace any that look bad. Gears can be purchased from the manufacturer or dealer.

Repack the case with fresh grease made specifically for power tools. Make sure gears are in place when you lubricate to prevent overfilling the case. If too much grease is applied it can seep into the armature compartment, so fill the gear case only half to three-quarters full.

You'll have discovered by now whether yours is a direct-drive tool or one equipped with a friction clutch (coil spring). This spring fits around a split gear from which it should now be removed, one coil at a time. Replace it if any obvious distortion is apparent or if resiliency and tension are noticeably lacking.

What if nothing happens?

Now let's suppose you plug in that hedge trimmer, turn on the switch—and nothing happens. You can be sure that one of the following ills is afflicting the motor:

- A bad armature, or brushes so badly worn that they're failing to make contact with the commutator. Well, you've already checked on this, so maybe it's—
- A defective line cord or a bad switch. Finally, check for—
- A break in the field circuit.

A break in the field circuit means that the motor is probably *kaput*. In this case, the game (of having the motor rewound) isn't worth the candle (what the job will cost you). Recommended solution: buy a new trimmer.

A continuity tester with needle probes can be used to check the line cord and switch—and they're the more likely trouble spots anyway.

First, detach any extension cord you may have hooked the tool into—it could be the culprit. Plug the tool cord directly into the wall outlet. If it still doesn't run, wiggle the cord at the point it enters the handle (a break, when it occurs, usually happens here). If the tool starts as you're wiggling the cord, you've found the trouble.

If it still fails to respond, check out the switch. The best clue to a bad switch is its failure to give off a sharp *click* when it is turned on or off.

To replace the cord or switch, use a pair of pliers to pull down the Bakelite or

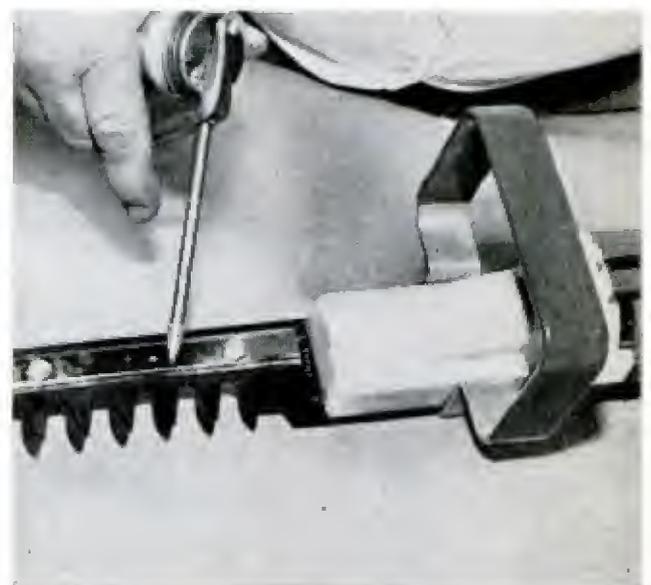
(Please turn to page 182)



USE KEROSENE to remove old grease from gear case. Repack case only two-thirds full with fresh grease

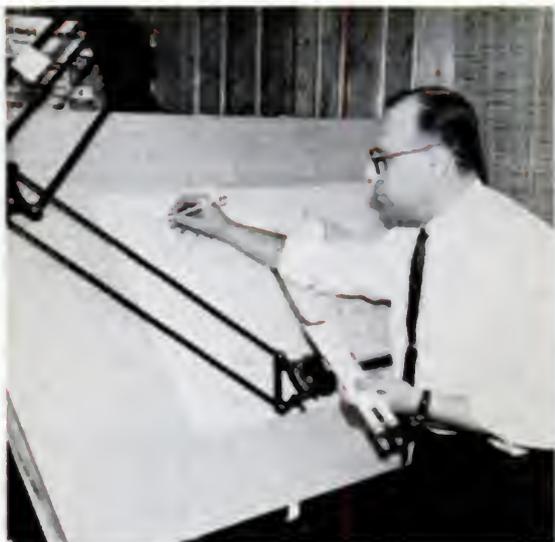


WHEN REATTACHING BLADE, be sure slot on underside of the blade is fitted securely over the gear cam



FINISH UP BY OILING the cutting blade; continue periodic oiling of the blade throughout the season

IT'S A FOUR-HOUR KIT Assembling



Power-Wheel Truck



How the mule was born. PM's editorial director, Walter Ian Fischman, deserves the title of "Father of the Lawn Mule."

It all started when he spotted an item in an industrial paper about a materials handling device called the "Power Wheel"—a wheel with an engine on top which could be mounted in any chassis to turn it into a powered vehicle. Thinking that this might be a good item for use in a do-it-yourself project, he called the manufacturer, Technoid Corp., and set up an appointment with the president, Peter Prohaska (above), to see the unit in action.

While watching a Power-Wheel-powered cart carry a mountain of machinery through a tight zigzag course, he remarked, "You know, that could be turned into a fine little garden tractor." Prohaska started preliminary design work that very night.

Naturally, the story is a **PM** exclusive.

IF YOU CAN HANDLE a screwdriver and a wrench, you'll have no trouble putting the Lawn Mule together. It's about as foolproof as any kit could be.

You don't have to do any welding, shaping or fitting, since all the parts are completely finished and ready to bolt together. Just to be on the safe side, any subassembly which *might* present a problem, is put together at the factory. All you have to do is install it. Even the painting is taken care of—everything that should be painted is shipped painted.

The job is so simple you can start on a Saturday morning and be running the Mule around the lawn that same afternoon.

Before tackling any big lawn jobs, however, try a short practice run to familiarize yourself with the Mule's unusual steering-control system. Once you get the feel of it, hitch up the mower or trailer and go to work.

The special trailer for the Mule is shipped knocked down. The body measures 18 x 36 x 42 in., and it's a sturdy welded construction. Load capacity is 1200 lbs.

Two catches on each side make possible



TRAILER TAILGATE swings down level with bed to accommodate long loads and increase carrying space

the Lawn Mule



DUMPING LEVER is located on the trailer tongue, can be operated from driver's seat. Tailgate swings out



TO TAKE OFF the tailgate entirely, just release two catches on each side. This often simplifies loading

ASSEMBLE THE POWER WHEEL . . .



1. **TURNTABLE** subassembly is the first step. Once ball race is filled, hole is plugged with a screw



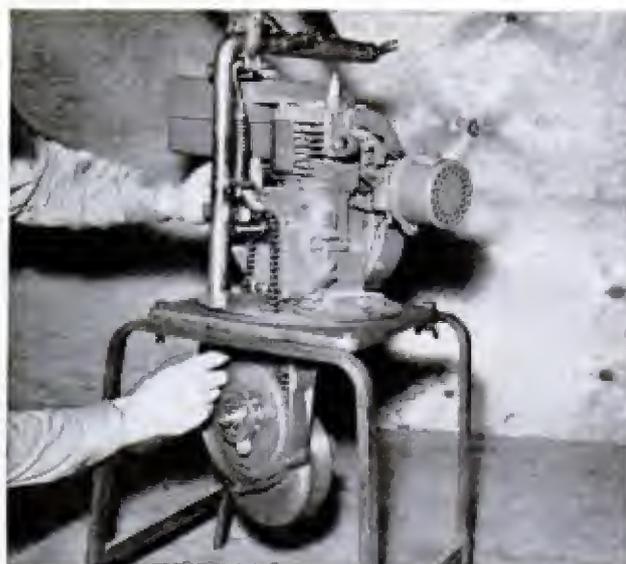
2. **CLUTCH ASSEMBLY** slides onto the countershaft after turntable has been placed on assembly stand



CUT,
FOLD,
TAPE

LAWN
MULE

3. **CLUTCH-BRAKE CAM** and its control rod are installed next, followed by assembled control handle



4. **ENGINE** is bolted to turntable, then the drive sprocket is secured to shaft and chain connected



5. **HOUSING COVER**, with sealed ball-bearing assembly in place, goes on last. It's held by five bolts



6. **ADD THE HOOD** and the Power Wheel is complete (except for the wheel), ready to go into the Mule

. . . THEN BUILD THE MULE!



7. REAR AXLE fits into holes in body, is held by bolt through hole in body into topped hole in axle



8. REAR WHEELS are secured with castellated nuts and cotter pins, taking care that they turn freely



9. POWER WHEEL can be slipped into the body once the front has been propped slightly above level



10. FOUR BOLTS hold the Power Wheel in the body. Be sure these are tight before you continue assembly

pivoting of the tailgate from either top or bottom, so you can use it to extend the trailer bed for long loads or for dumping bulk loads. Dumping is controlled from the driver's seat through a lever located on the trailer tongue. Once you've emptied the trailer, just pull the body back down until it latches to the tongue again (there's a grab handle for this on the front panel of the body).

Bolting the axle, catches and other fittings to the body shouldn't take you more than an hour.

Through a special arrangement with PM, the manufacturer is offering the Yard Mule kit for \$325 until July 31, 1966. After that date, only the completely assembled Mule (\$450) will be available. The trailer

sells for \$99.95.

As of this writing, two additional accessories for the Lawn Mule are now in the final stages of testing—a 42-in. $3\frac{1}{2}$ -hp rotary lawnmower and a 42-in. snowblower with a $3\frac{1}{2}$ -hp winterized engine. The mower will sell for \$179, the snowblower for \$195. According to the manufacturer, these will be available in time to ship with the Lawn Mule kit.

Incidentally, all prices mentioned here are f.o.b. the manufacturer: Technoid Corp., Box 276, Portland, Pa. Shipping charges will be billed c.o.d.

To show you just how simple it is to assemble this kit, we've covered the whole job in step-by-step photos. Basically, it's two separate operations: assembling the



11. **FRONT WHEEL** slips over studs in the hub of the Power Wheel. Tighten nuts so there's no play left



12. **SEAT SUPPORT**/trailer hitch is mounted with two bolts which fit into tapped holes in the body



13. **PADDED SEAT** bolts to the seat support arm and completes the assembly. Total time? About 4 hours



14. **ADJUSTING** combination clutch-brake control is a simple job which takes only a minute or so

Power Wheel and putting the rest of the vehicle together. Installing the Power Wheel in the body is a matter of tightening only four bolts.

The Power Wheel must be put together on some sort of simple assembly stand which will support it in a vertical position. Plans for such a stand are included with the kit, but you could just as well knock together a rough stand from a couple of sawhorses and scrap lumber. Anything will do so long as it's strong enough to hold the unit in an upright position with the drive mechanism off the floor.

Only one step is omitted from the step-by-step photos on assembling the Power Wheel. Before you attack that turntable subassembly, the control handle should be mounted on the handle support. Clamp the support in a vise, slide the handle onto the support and secure it with a cotter

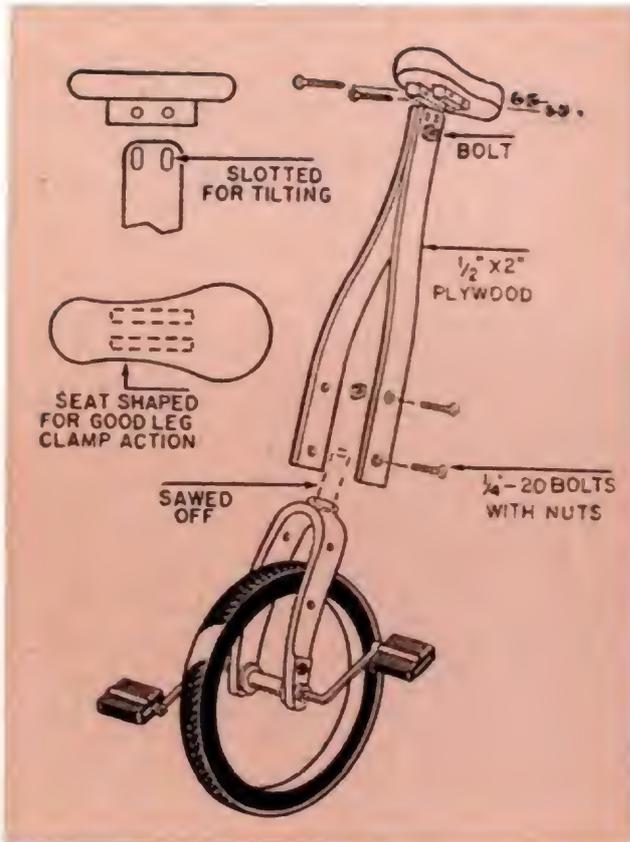
pin. It's now ready to bolt in place.

There are few possibilities for error when assembling the Mule. Be sure that you tighten all bolts and nuts securely, with the exception of those holding the rear wheels on the axle. Here you should allow only enough play for the wheels to turn freely.

Adjusting the clutch-brake control is the final step. Roll the Mule outside, put gasoline in the tank, open the fuel shut-off valve and start the engine. Then, by trial and error (it shouldn't take more than two of each) find the proper height for the control rod so that the brake doesn't drag when the handle is in neutral position and the clutch doesn't slip when the handle is pushed all the way down.

That's all there is to it—from first assembly step to final adjustment in only four hours. ★★★

Fun With a Unicycle



ONE LITTLE WHEEL—a unicycle—can make any “well-balanced” boy a Big Wheel in his neighborhood.

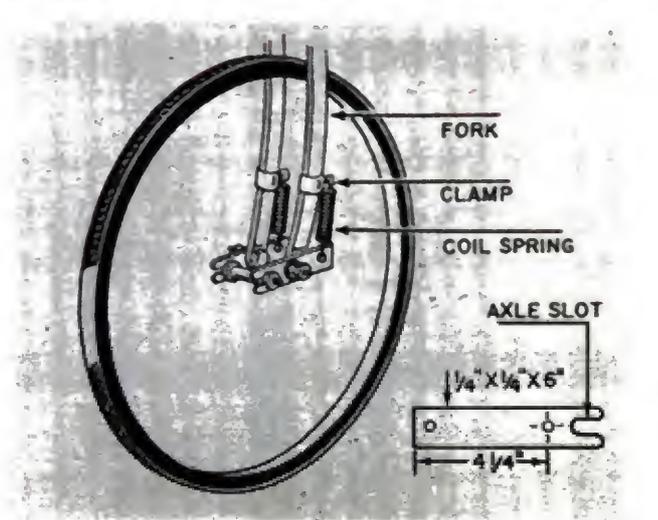
As can be seen from the above drawing, a unicycle is a fairly simple assembly requiring few parts. The wheel, fork and pedals are taken from the front-wheel assembly of an old tricycle. The tricycle fork is then bolted between a larger fork made of two lengths of $\frac{1}{2} \times 2$ -in. plywood which

supports the seat. Buy or make a comparatively narrow seat or saddle of the type shown to better enable you to clamp the seat between your legs while learning to ride the unicycle. And make no mistake: learning to ride one of these solo wheels takes *practice, practice and more practice*. Don't give up after the first 50 attempts. On that 51st try you'll probably start to get the hang of it.—Hank Clark

Add Shock Absorbers to Your Bike

AN IMAGINATIVE young reader from north of the border, Karl Friesen, 14, of Grande Prairie, Alberta, sent in this original idea for installing coil springs on the front wheel of a bicycle. Cost: \$1.50.

Two 50-lb. expansion springs are snapped in place between clamps attached to each side of the fork, then to two identical steel plates that bolt to the bottom of the fork and which advance the axle slot about 2 in. The axle of the wheel is then bolted in the axle slots of these two “rocker” plates. The result is a real “knee-action” ride that absorbs bumps and introduces new comfort to bike riding.



Sculptured Garden Ornament

BY ROBERT HOPPOUGH

EVERY GARDEN needs a focal point. For top dramatic effect, you can use your own sculpture, instead of a tree or shrub.

Forget about mallets and chisels for this job. Just odds and ends and your fingers will do for tools. Wood scraps, sand, ce-

ment and iron rod are the basic materials.

This Polynesian tiki, or anything your imagination can conjure, is an apt subject, but choose a shape that will be stable when set upon its base.

First, construct a frame for a mold—in





BEFORE CASTING, measure a reinforcing rod against mold. A bend will carry the rod across the base



ANY APPROPRIATELY SHAPED TOOL can be used to impress facial features into sand, which must be moist



AFTER THE MOLD IS FILLED, press in the reinforcement at least 1 in. below the surface. Smooth over



WHEN SCULPTURE HAS SET, but not fully hardened, remove mold and brush away sand except under face

JUNE 1966

this case, merely a rectangle with a separator to form a flat-topped base. Jigsaw additional wood pieces to form the tiki's outline and support its edges. Then place the frame on a board the size of the frame.

Bend and cut a length of iron rod, tubing or other metal that can be used for reinforcement. It should clear the mold by at least an inch at all points.

Now lay in some moist sand and round it out for the shape of face desired. Work quickly to prevent the sand from drying out and crumbling. Contour the facial details, using any appropriately shaped objects, such as bottles, spoons or fingers.

Mix the concrete and add dry coloring, if you wish. Make enough at one time so you won't have to try to match the color in a later batch. Remove some of the concrete to a coffee can and thin with water to a consistency that will not damage the facial details when poured in and that will fill in the features completely. For extra protection, pour this mix through your fingers to break its force. Finally, fill in the rest of the mold with the regular mix. Press in the reinforcing rod and smooth over.

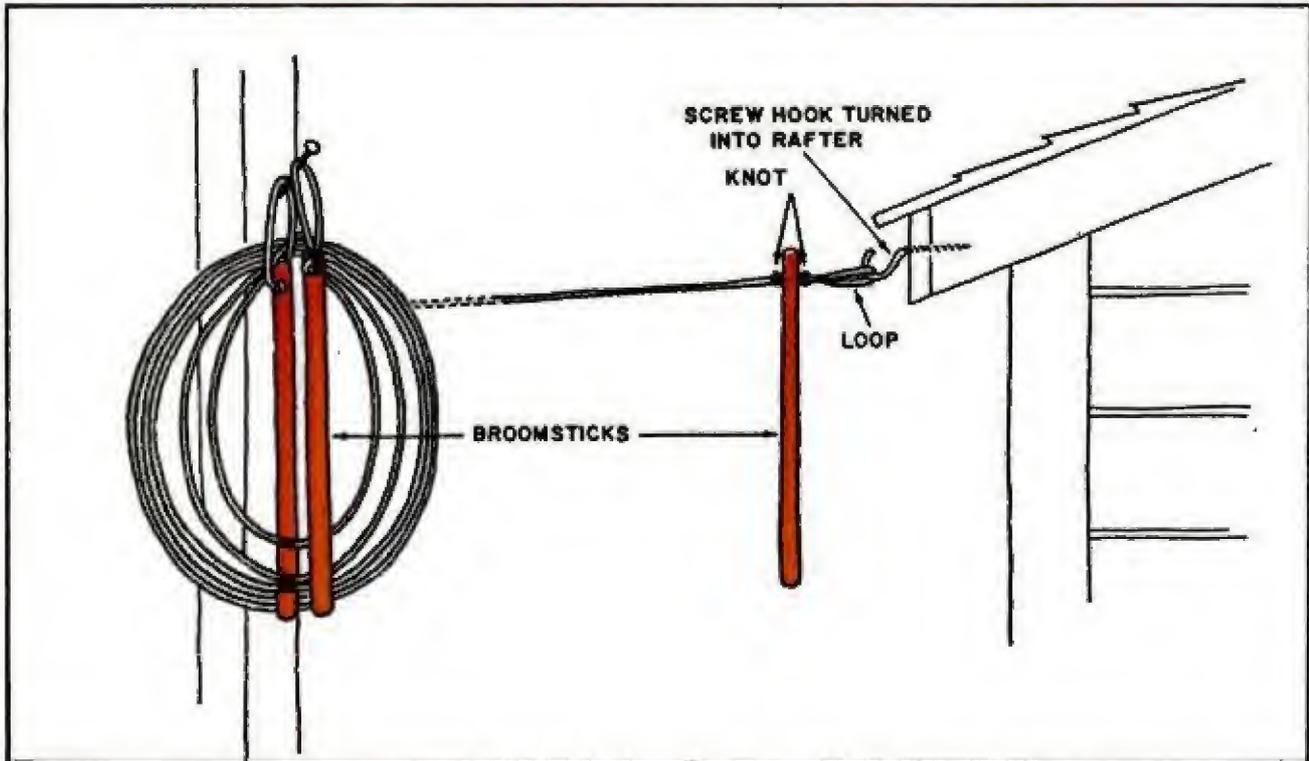
When the concrete has set enough to lose its plastic quality, but before it has fully hardened, remove the mold and raise the casting to an upright position, using the loose bottom board for support. Smooth the casting with burlap and work in finer details. Finally, cure the concrete by wrapping it with burlap and sprinkling with water for three days.

Select the site for your tiki near a garden wall based on whether the sculpture is to be viewed from within the garden, from a window or from a patio or terrace. For nighttime viewing, run wiring to a spot or floodlight and orient the light for the most dramatic effect. ★★★



STAND UP SCULPTURE by means of bottom board, smooth off the surfaces and put in finishing detail

SOLVING HOME PROBLEMS



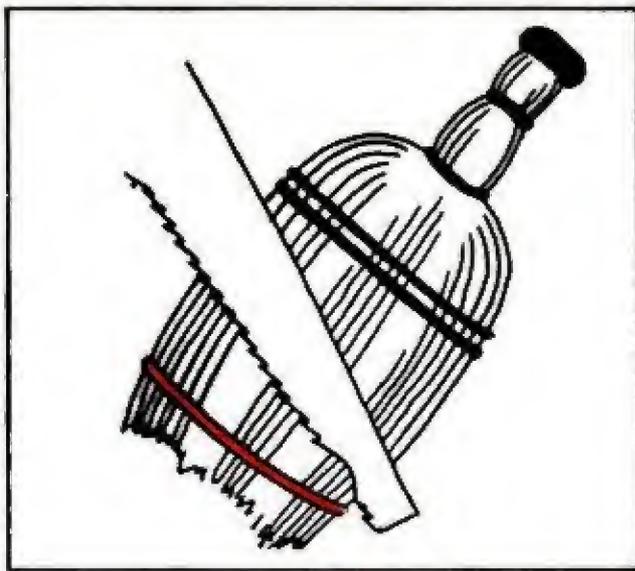
JUMP-ROPE CLOTHESLINE running between house and garage slips over screw hooks installed at the eaves, can be taken down when not needed. Long dowel handles on either end make it easy to slip loops over hooks



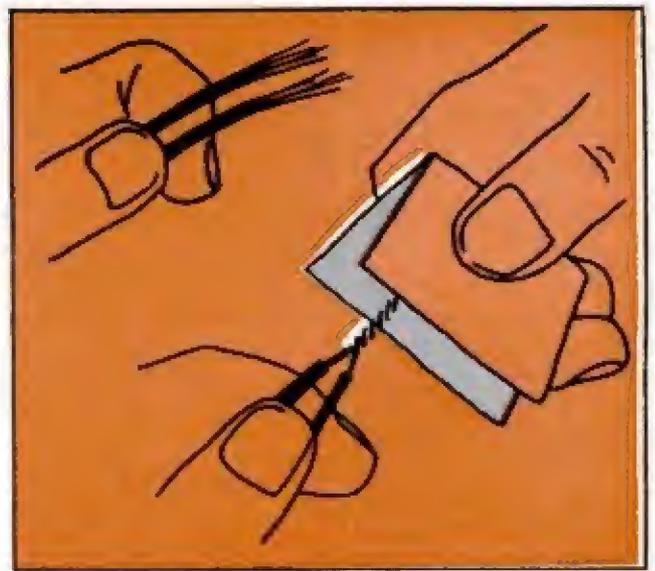
SHORTCUT TO TRIMMING a child's bangs in a clean, straight line involves taping bangs to forehead and using the upper edge of tape as a cutting guide



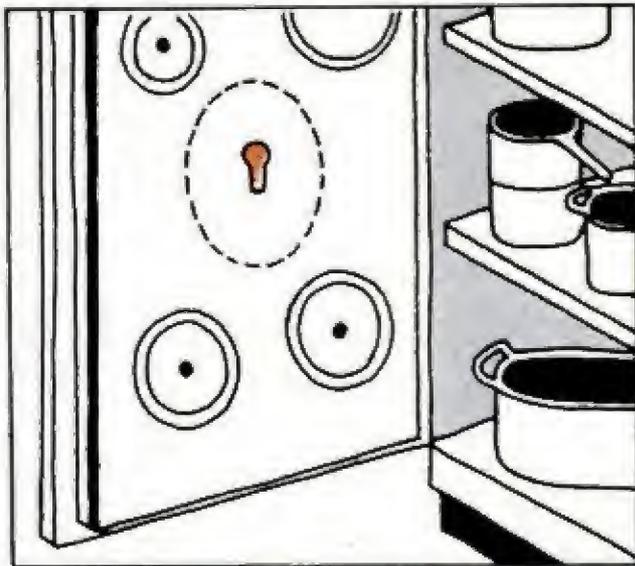
SUPER MATCH for lighting pilots is made by slipping a ball of absorbent cotton over the end of a hooked stiff wire. It won't blow out or leave any ash



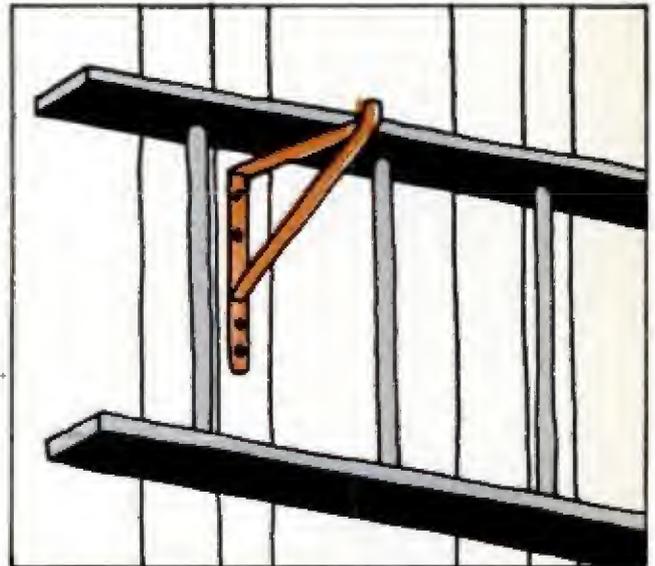
DEWHISKERING a worn whiskbroom is easy if you snap a rubber band around the end, dip it in water and freeze it, then use a saw to cut straws even



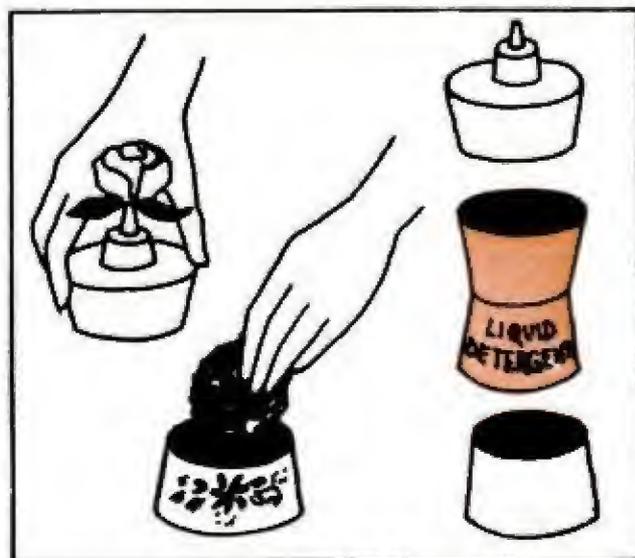
SURE METHOD of cleaning copper wires prior to soldering is to twist them together in a fold of garnet paper, not with bare fingers or pliers



HIDDEN RACK for holding pot lids can be added to inside of cupboard door. Cut keyhole slots for lid knobs in hardboard panel and mount on 1 x 1 frame



EASIEST WAY to store a ladder is on two or three shelf brackets fastened to garage studding. Bend up the tip of each arm to hold ladder on the rack



YET ANOTHER TIP involving plastic bottles: You can make a container for scouring pads from the top and bottom portions of a liquid detergent bottle



INVERTED TUMBLERS are fine for holding dress patterns in place when pinning them to the material. Tape a pincushion to each for extra convenience

An Easy Project for Easy Living

TAKE IT EASY! Build this simple patio chaise on Saturday and snooze in it on Sunday.

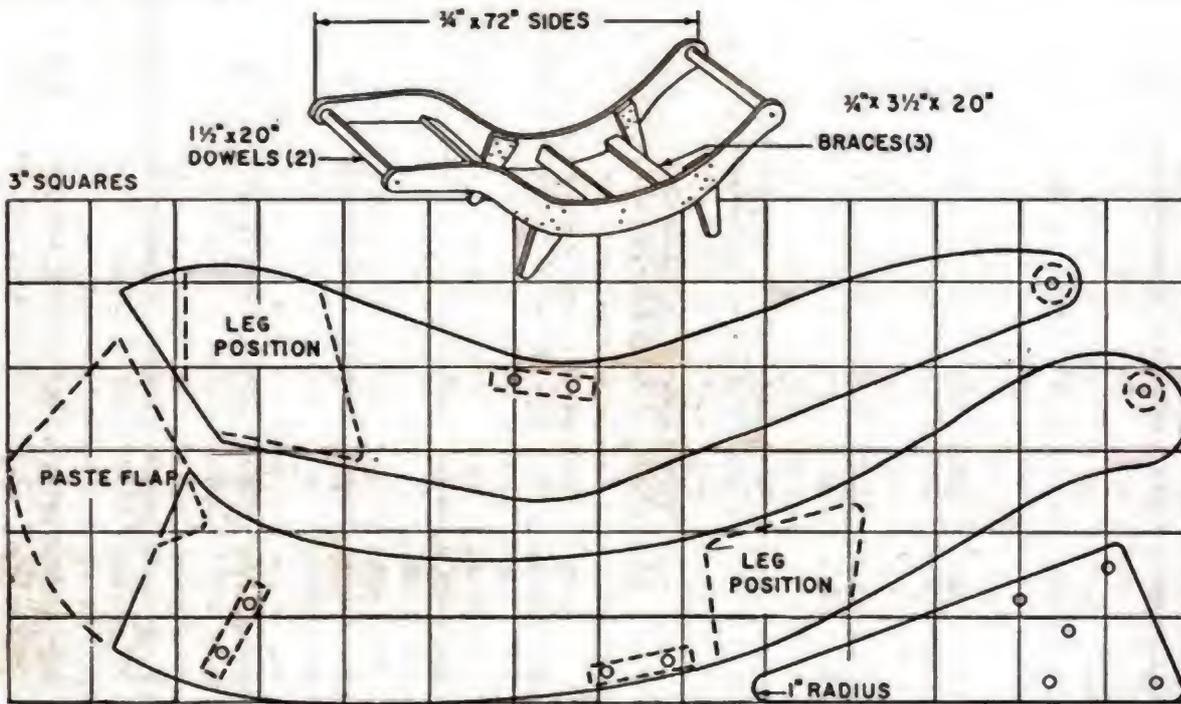
Your main materials are $\frac{3}{4}$ x 36 x 72-in. plywood good on two faces, a 4-ft. x 1½-in. closet-pole dowel and 45 yds. of 2-in. plastic webbing.

Enlarge the side patterns and paste the halves together, overlapping as shown. When transferring the pattern

to the wood, punch through to mark the countersunk $\frac{3}{16}$ -in. screw holes.

Attach the legs first, using waterproof glue and 1¼-in. No. 10 F.H. screws. Then attach the dowels and braces with glue and 1½ in. F.H. screws. Paint.

With tacks or a staple gun, attach the crosswise webbing around and inside the sides. Interweave the lengthwise strips and tack to the dowels.



IF YOU PREFER TO WORK from full-size patterns, send 75¢ to Steve Ellingson, Popular Mechanics Pattern Dept., P.O. Box 2383, Van Nuys, Calif., and ask for pattern No. 93.



YOUR OUTBOARD MOTOR

Troubleshooting Remote Controls

You're more likely to have trouble with the cable than the box, but here's the A-B-C procedure for finding out what's wrong and how to put it right

By Henry B. Notrom

THE GREAT THING about troubleshooting remote controls is that they're relatively simple gadgets. Nine times out of ten, you can locate the cause of a malfunction by checking a couple of critical areas.

The key to finding out what's wrong lies

in following a set and orderly procedure. With so many different remote-control units on today's market, however, it's impossible to give specific troubleshooting information on every single one. Thus, we'll cover the possible areas of failure in any control and let you apply this to your





TO CHECK CABLE functioning, disconnect the cables from the engine. This involves only two connections



MOVE THE LEVER (or levers, with dual controls) while keeping your eye on cable ends. They should move

particular unit, whether it's single or dual-lever, mechanical or electrical.

Okay, let's suppose you start the engine, shove the remote control lever into gear and nothing happens. Or possibly you start to move but when you shove the lever forward to give it the gun, you continue to move at a crawl.

Back up to the dock, Jock, and let's begin checking it out. As explained last month, shift failure can signify a problem with either the remote control or the lower unit. So the first test is to disconnect the control cable at the motor and try shifting the engine manually.

If the engine doesn't shift into gear by

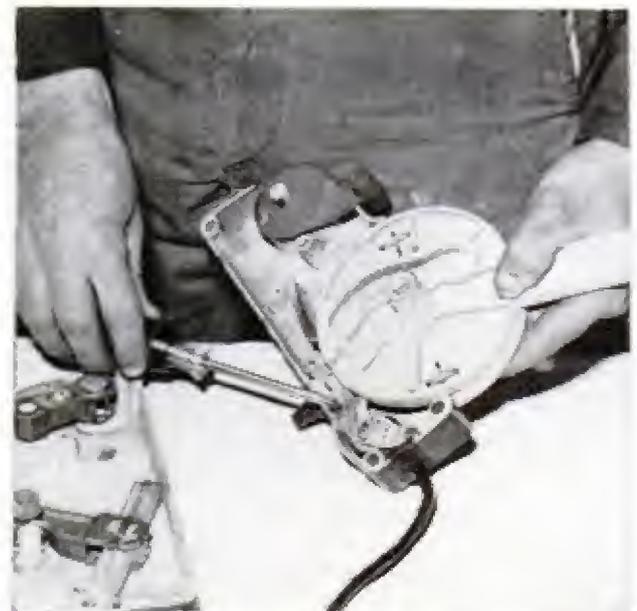
hand, the problem's in the lower unit, so go back to last month's article. If it does shift, then the trouble is with the remote control setup.

Now, if the shift works fine, but the engine fails to speed up when you shove the lever forward, the problem is most likely with a faulty remote throttle control. But it could also be with the throttle control on the engine or with the linkage. To find out which, disconnect the throttle control cable at the engine and goose the throttle by hand. If the engine does speed up, the problem is a remote control one.

More often than not, a remote control problem is centered in the cables. Each



ELECTRICALLY OPERATED remote unit is shown here with shift switch in neutral. Note position of cam



PUSHING LEVER into gear trips the switch cam, sending current to engine which shifts gears electrically

cable is actually two cables in one, an inner cable inside an outer cable. One controls shifting, the other throttle.

Cables can freeze up, or the inner cable can bend or kink. There is only one solution to a bad cable—replace it.

The first thing you have to find out, though, is whether the problem is actually with the cable or in the control box. So, activate the lever or levers (if you have a dual-lever box) and watch the cables, which have been disconnected from the engine. If the cables are working properly, you'll see them move throughout the entire range of lever operation.

If a cable is fouled, it has to be disconnected from the control box as well as from the engine before you can replace it. The control box must be unbolted from the side of the boat and the cover taken off. The cable end is then disconnected from its position in the box.

Before removing the cable, however, make sure it hasn't come loose from the lock setscrew that attaches it to the rack gear or cam. If it has, your problem is here, so just hook the cable back up and make sure the setscrew is tightened.

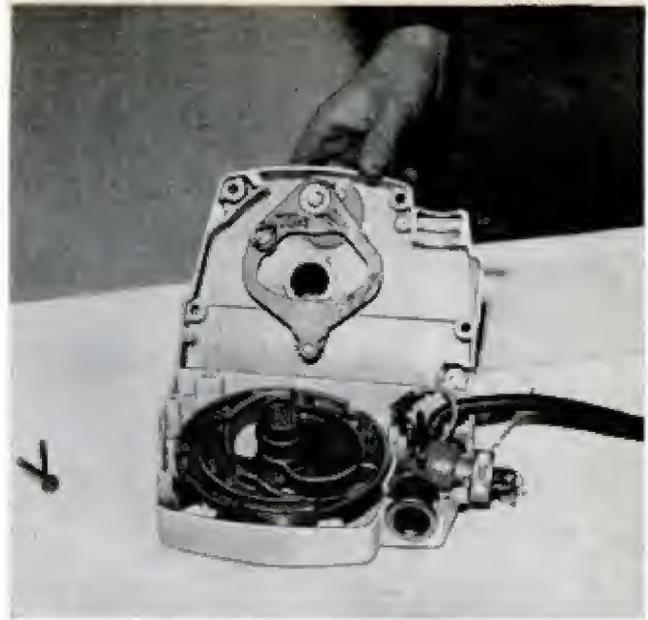
In determining how much new cable you'll need, measure the boat from the center of the control box back to the transom and then over to the center line of the transom. To this measurement, add:

— $\frac{1}{2}$ foot of additional cable for 6-cylinder, direct-reversing engines with left-side mounting.

— $\frac{1}{2}$ foot for 2-cylinder engines with left-side mounting.



TO REPLACE SWITCH, simply unscrew it and remove it from the box. You'll have to replace the wires, too



SINGLE-LEVER CONTROL without rack gear is difficult to work on, better left to a pro mechanic

— $1\frac{1}{2}$ feet for 6-cylinder, full-gear-shift models with right-side mounting.

— $1\frac{1}{2}$ feet for all 2- and 4-cylinder models with right-side mounting.

There are only a few things which can go wrong inside the remote box itself.

The single-lever control which doesn't have a rack gear works by means of cam action. As you move the control lever, a timing series in the cam allows one cam to shift the engine into gear before the throttle takes over. The shift cam is then overridden by the throttle cam.

This is a tricky box to work on but, luckily, the tricky part almost never goes wrong. For anything more complicated than a cable problem or lever replacement, however, take it to a mechanic.

Evinrude's pushbutton-shift control is electric all the way down. Two coils in the lower unit are controlled by the forward and reverse buttons on the remote box. Energize the forward coil and it engages the engine in forward gear; reverse operates the same way. When the neutral button is pushed, neither coil is energized.

While it's possible for one of the coils to short out, the only problems you might run into are a loose wire in the control box or a mechanical failure of the button switches. Even these are uncommon. It's a relatively trouble-free setup.

Despite the outer appearance, two-lever control boxes represent design simplicity. The unit itself is actually two single controls in one box separated by a plate. One lever operates the gear shift, the other operates the throttle. Both sides of the box



DUAL-LEVER CONTROL box (this one is an OMC unit) has shift control on one side and throttle control on the other, but both operate basically the same

are the same in makeup, and both sides make use of a rack gear.

Prevalent problems with this type of box include cable fouling, handle breakage and wires disconnecting from the lock set-screw in the rack gear.

Electrically operated control boxes aren't too tough to work on. (Electrical, incidentally, applies only to gear shifting.) As you move the handle into forward or reverse gear, the cam to which the handle is attached trips an electric switch. The switch sends current to the shifting to provide electric shifting.

Troubles which arise in this box are cable fouling, handle breakage, and also that electric switch. If the engine fails to shift, and the lower case and cable check out okay, the switch should be removed and replaced. Electric wires to the switch have to be replaced with the switch.

Generally, remote-control units function perfectly, but when they do go wrong, remember that the trouble is most likely in the cable. Treat that box as innocent until it's proven guilty. ★★★

OUTBOARD CLINIC

Q—The lower cylinder sparkplug of my 5-hp Sea King outboard is always black and wet with oil. The plug in the upper cylinder is always clean. I've checked, and both cylinders are getting a hot spark. I've also tried a hotter plug, carburetor adjustment and changing plug gap. What do you think?—J. G. B., Illinois

A—Despite your check of ignition, I'm still of the opinion that your trouble is probably in the magneto. If you checked the spark by holding the plug wire a little away from the powerhead and cranking the engine, you've checked only the secondary. The trouble could be in the ignition primary, and I think you should have the magneto tested with a regular magneto tester. Other things which could cause the trouble are a scored bottom piston and a bottom crankshaft seal that's not properly seated.

Q—I have a 1961 75-hp Evinrude that overheats but runs fine when I remove the inner parts from the thermostat housing. The impeller and thermostat are new, so what's wrong?—B. F., New Jersey

A—What about the water pump cover being new? It's always recommended that whenever the im-

peller is replaced, the cover be replaced, too (it could be eaten away). You could, of course, have an internal engine problem, such as a scored piston. But I'd try a new cover first.

Q—My 1958 35-hp Johnson has a complete new powerhead, carburetor and reed valve plate. Starting, though, is a problem. When the engine has been shut off for two hours or longer, it requires 10 good pulls on the starter pulley to get it going. After it does start, no more trouble.

The bulb is firm on the feed line, the gas tank is new, there's no water in the gas, the fuel filter bowl is full, and I have tried no choking, moderate choking and heavy choking. Plugs are also new. Can you suggest a possible solution?—R. D. S., Minnesota

A—I've got a hunch that your problem may be caused by one of two things.

There's a small ceramic-type filter where the line enters the carburetor bowl. If this is plugged up, it could be impeding the flow of gas to the carburetor, so get it cleaned and keep it clean.

There may be a pinhole in the fuel pump diaphragm which is causing gas to hold back on the initial start. If so, the diaphragm should be replaced.

Any Questions? For a personal reply to questions concerning repairing your outboard motor, write to Outboard Clinic, Popular Mechanics, 575 Lexington Ave., New York, N.Y. 10022. Enclose 25 cents in coin



How to Frame a Float

Whether it's simply a festooned convertible (for the Parade Queen to wave from) or a platform on a trailer or truck bed (for an elaborate tableau), here's how to turn a plain vehicle into a handsome float

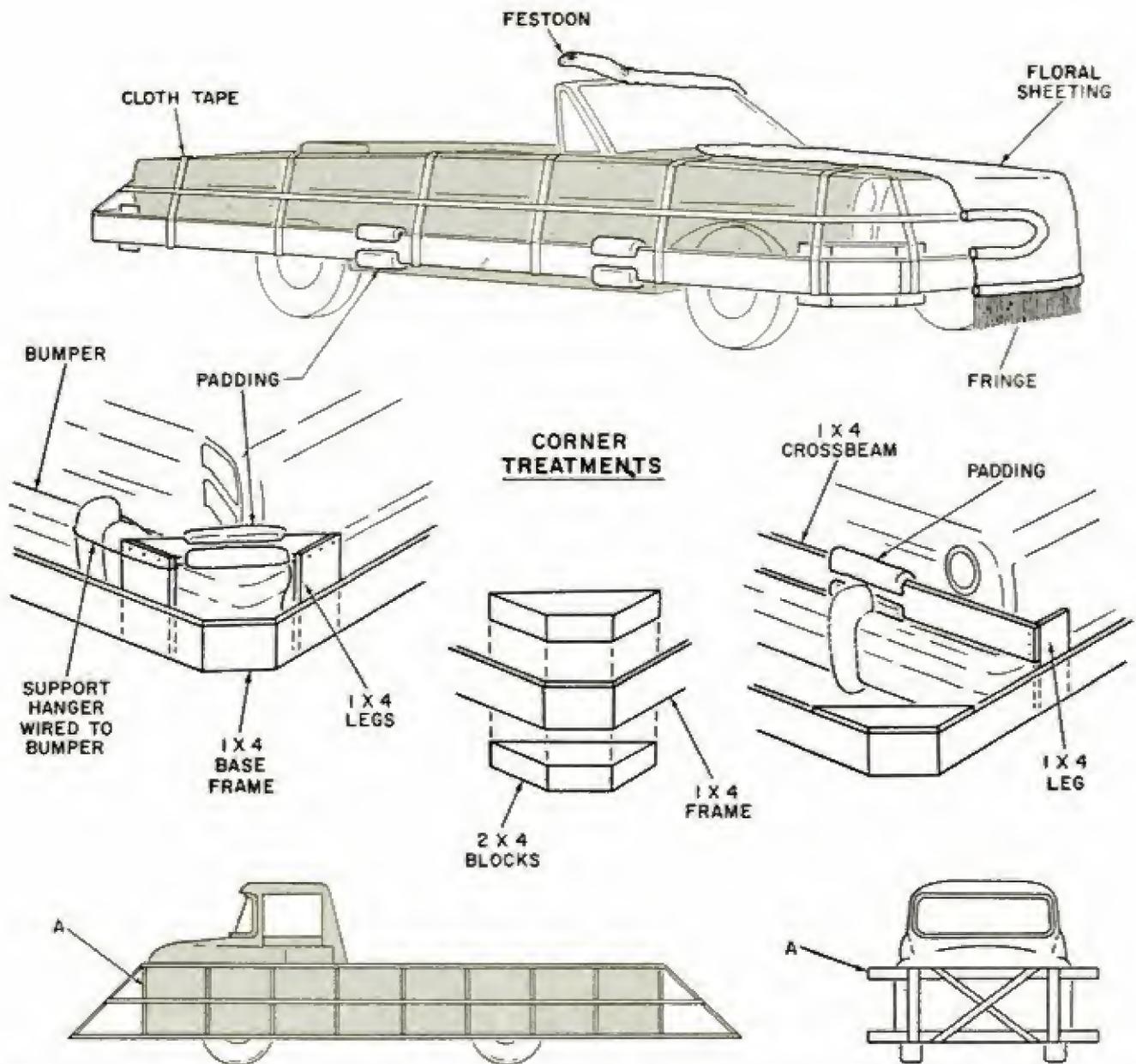
THE DRUMS ROLL, the trumpets blast a fanfare, the brightly uniformed band steps off—and the parade (trailed out behind, frozen but alert) leaps suddenly to life.

If you're at curbside along the route, or in the viewing stand at the fairgrounds, you needn't dread the approach of the float you worked on for your club (or your child's school class) while you wince at the quality of the competition. Float-making can be an art, as you've seen on pages 84 to 87, but the actual construction involved can be quite simple. You can do a respectable job with ordinary lumber and a handsaw. It's merely a question of creating a shell to hang over a car, or a

skirt for a truck or trailer. And since you probably have a reputation around town as a craftsman, sooner or later you'll be asked to create this underpinning. On the next two pages, we give several examples of framing that should take care of any hometown parade requirements.

In the case of the Queen's car, the main problem is hanging the frame from that shiny convertible without leaving permanent scars. You take your measurements from the car itself and cut the 1x4 skirt-frame to suit. The only thing to watch is that you allow sufficient width for the front wheels to turn without binding.

The frame is hung from cloth strips passed over the hood and trunk deck. The



square design of today's cars makes this fairly simple. But the "beveled" corners of the frame must be tied on the bumpers to avoid "hoop-skirt sway" when the float's in motion. Where a bumper protrudes enough at each side to permit it, you can just sandwich it between two 1x4 blocks nailed across the corner to form a pocket. Rear bumpers often require a different treatment. When they're molded close to the body, you may be able to hang the frame from each end by means of a U-bracket, as shown in the left detail, above. (Remember that the side rails can be snugged to the rear fender since these wheels don't pivot.) Place cloth or foam-rubber padding under the bracket to avoid scratching the chrome, and use wire with heavy insulation to secure the bracket to any handy part of the bumper.

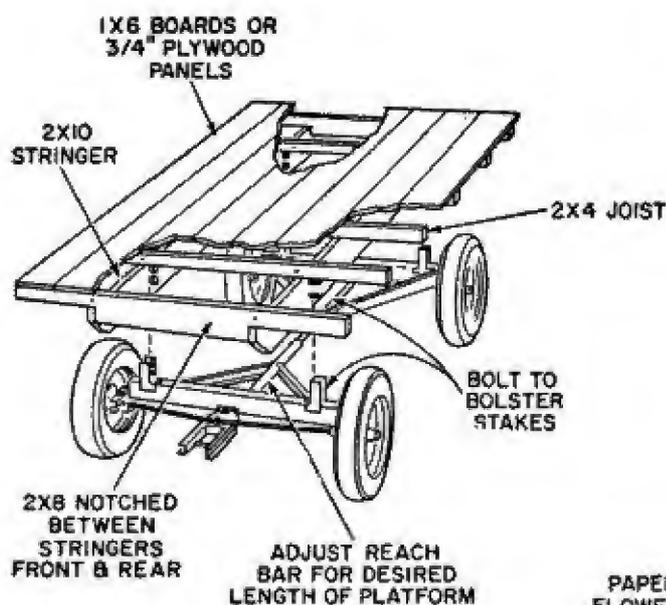
Where the bumper extends back from the body, there's often space to wedge a 1x4 crosspiece in front of the bumper. If

so, merely nail short legs at each end from which the side rails can be hung.

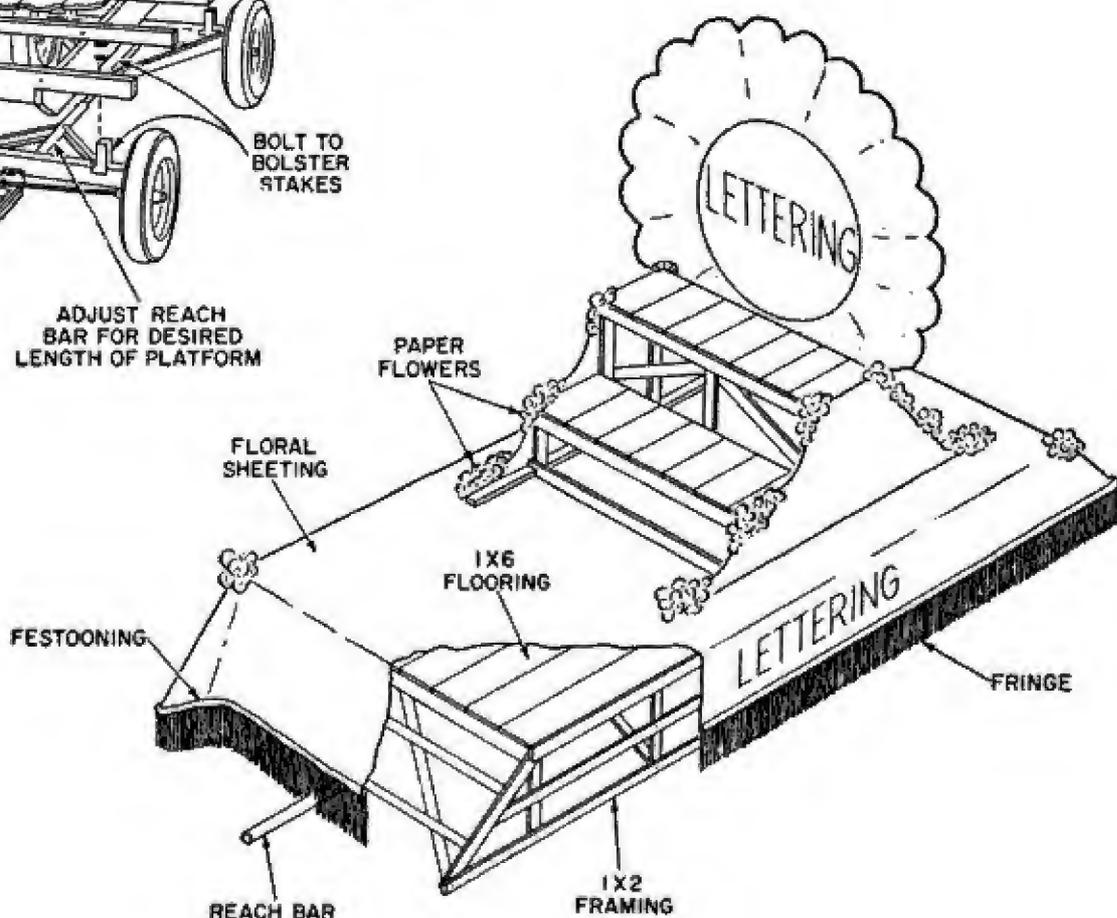
The bottom edge of the frame should ride about 15 in. from the ground, and should be generously padded at all points where it might rub the body. Scraps of foam rubber, attached to the inside face of the rails with rubber cement, are ideal for this purpose.

The cloth strips can be cut from canvas or other durable material, or you could use upholsterer's webbing or cotton venetian blind tapes. These strips pass all the way across the hood and rear deck, and are stapled to the rails at each end. At the center of the body, they can be tied to window handles or around armrests.

Cover the entire frame with floral sheeting, obtainable from a florist's supplier. To prevent wind from lifting the seams while the car's moving, start at the top-rear of the body and pin the sheeting to the cloth strips, lapping toward the back



SUPERSTRUCTURE design depends on number of riders to be posed there. It's often just the sturdy two-step platform shown below. Background can be any shape cut from wallboard or plywood, firmly braced



as new sheets are applied. Lap about an inch, and be sure to bring the pin points outside so they won't scratch the car.

Staple the sheeting along the rails, then staple the fringe on top the sheeting's bottom edge, and cover this joint with a strip of festoon. Don't block the air-intake grille. Leave an opening here—you can trim the edge with festoon and apply a number of vertical strips to mask the gap.

Framing a skirt for a flatbed truck is even simpler, since here you needn't worry so much about the vehicle. The frame marked "A" in the sketch on the previous page is nailed up of 2x4s (with 1x4 cross-bracing) and wired to the front bumper. This frame should be as wide as the truck bed, assuming this allows proper clearance for the front-wheel pivot. The height should bring the top rail a few inches above the hood. The side aprons are 1x2s, framed to any desired shape.

Using a technique similar to that for the convertible, apply floral sheeting,

fringe and festoon. The appearance will improve if you carry the sheeting across the hood—but leave a few inches of air space between hood and sheeting to prevent fire hazard.

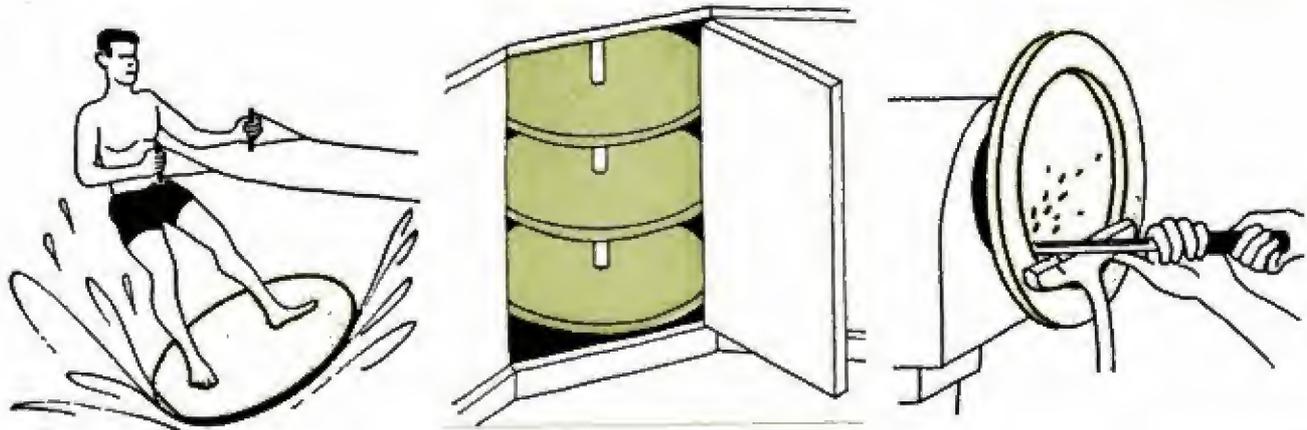
The most effective common vehicle for a float is a "wagon gear" of the type used for farm trailers. These rigs have an adjustable column (reach bar) between the axle assemblies, so you can adjust for any length float you wish. If the float is to be over 25 ft. long, bolt 2x12 stringers to the bolster stakes, instead of the 2x10s indicated above. The 2x4 cross members are set on edge, just like floor joists in house construction, and are toenailed to the stringers. The platform surface is either 1x6 flooring and 3/4 plywood.

Determine apron dimensions by measuring the distance between the top of the platform and the ground, then deduct 15 in. for the fringe drop. When stapling the fringe in place, leave about a 2-in. ground clearance to keep the fringe clean. ★★

3 jigs for cutting wood discs

There's a point to cutting true discs with these simple jigs—a pivot point. Pick the jig that's right for your saw and you can cut any size disc quickly and accurately.

By Dr. C. E. Banister



SAUCER SKIING, lazy-Susan corner cabinets, blanks for turning wooden trays—these are only samples of projects that require accurately-cut discs. Round tabletops are also much in vogue, for everything from simple nested serving sets to elaborate tier tables.

Cutting discs for such projects is a tedious (and usually inaccurate) chore on a bandsaw or jigsaw if you attempt to feed the stock to the blade by hand. On a bench saw, it's virtually impossible. But an adjustable jig makes fast work of circle cutting on whatever type of stationary power saw you own. And one of the three designs shown here should be just about right for your needs. In the interest of safety, accuracy and durability, all three are designed to be as sturdy as commercial workshop equipment.

The adjustable jig lets you cut discs of from 2½ to 24 in. dia. on an average bench saw. To make it, square up a rectangle of ¾-in. plywood and dado a ¼-in.-deep groove across the center, as shown. Widen this groove on each side to a depth of ⅛ in. for the hardboard strips that lock

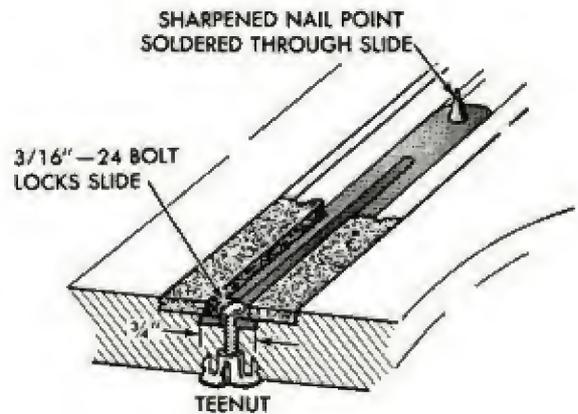
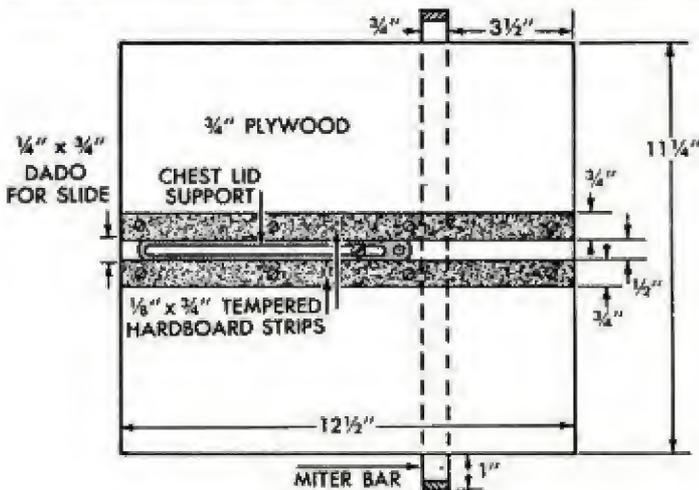
the slide in place and prevent its being bent when work is removed from the pivot point. The groove dimensions shown were to fit a 7-in. sliding chest-lid support I used to carry the pivot point. I removed the mounting bracket and drilled a hole in the opposite end to take a 6d common nail, cut to a ⅝-in. length and ground to a point. I soldered the nail to the slide and ground the head thin enough to permit easy movement in the track.

Now, drill a hole at the exact center of the groove and counterbore the opposite face to take a Teenut. Dado this bottom face at right angles to the top groove and set in a hardwood bar that will provide a sliding fit in the miter-guide grooves of your bench saw. My saw's grooves call for a bar ⅞ in. thick by ¾ in. wide.

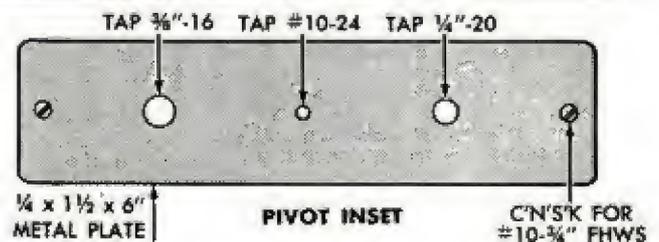
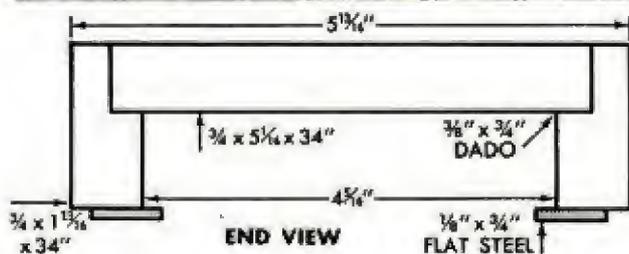
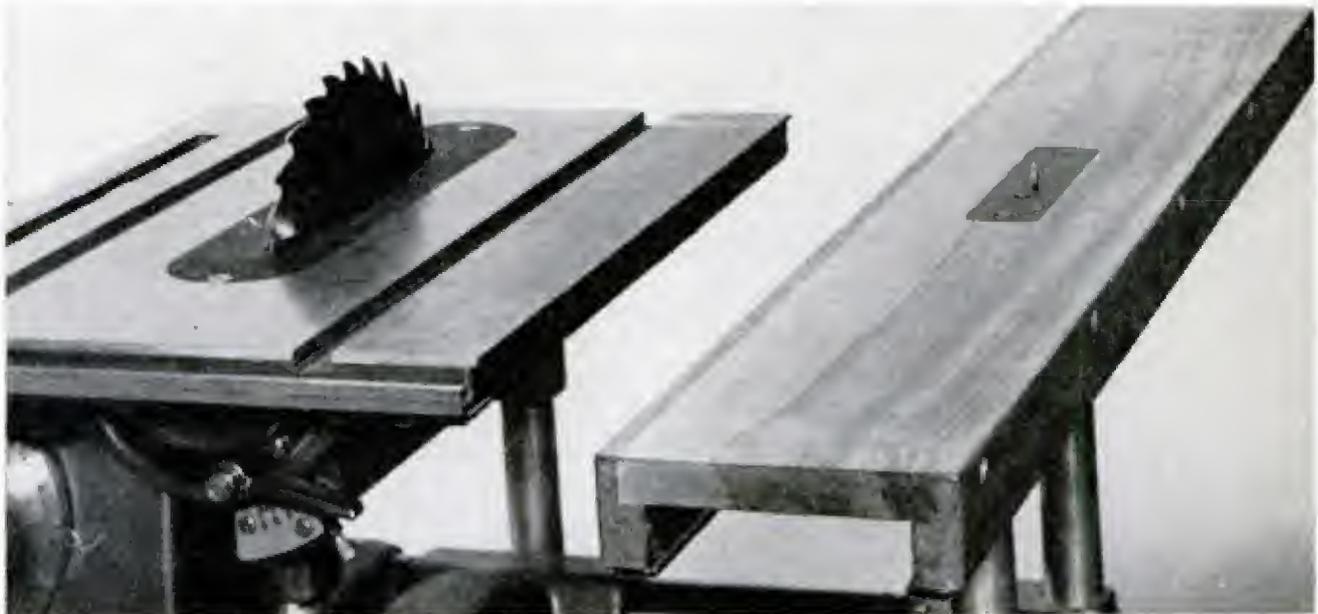
Attach the hardboard strips with glue and screws and finish the wood parts with a coat of sealer and a coat of varnish. Tap the Teenut into place, slip the slide into the track and secure it with a bolt through its center slot. Wax both faces for easier sliding and pivoting.

To use the jig, cut a square plank

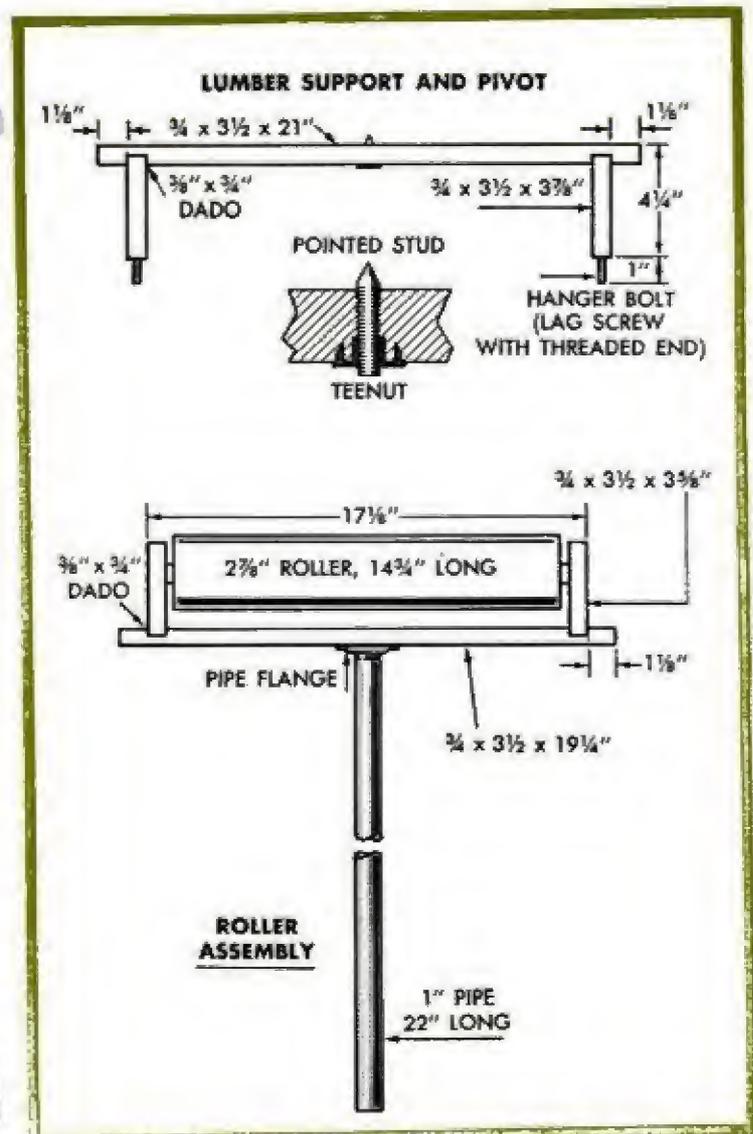
1 Adjustable jig for small discs on bench saw

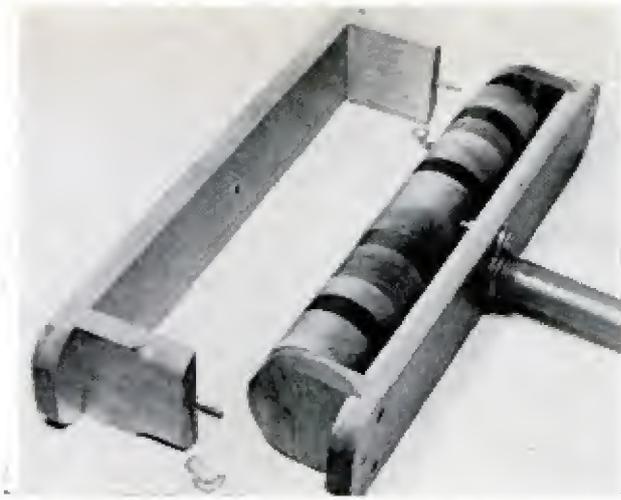


2 Extension-table jig for big discs on Shopsmith



3 Dual-purpose jig for large discs on bandsaw





WHEN PIVOT ISN'T NEEDED, yoke detaches, exposing roller to support lumber projecting beyond saw table

slightly larger than the diameter of the disc you need, scribe lines from corner to corner and punch with an awl where they cross. Flip the panel over and place this mark on the pivot of the jig, then tap the upper face with a mallet to drive the point in. To figure the jig adjustment, space the pivot point the desired radius from the saw tooth nearest you as you stand at the saw, then tighten the lock bolt to hold this position while you work.

Next, pivot the work to present a corner to the blade and make a straight pass, as if cutting a miter. Trim off the other corners until the work is a rough octagonal shape. Now crank the blade to its highest point and reposition the pivot the desired distance from the new first tooth. Turn the disc slowly into the blade. The cut will be slightly tapered, but it's easy to true up the edge later by pivoting it against a sanding disc mounted on the saw's arbor.

For cutting, always use a combination blade with medium set—and be sure it's sharp. To prevent splintering, replace the metal inset on your saw with one made of 1/4-in. tempered hardboard or plywood, slotted with the same blade you'll later use, in order to obtain fuller support for the underside of the work.

The second jig is designed specifically for the popular multi-purpose Shopsmith. It's simply a saddle that slips over the tool's extension table. Since you can move the table itself back and forth to adjust for the desired radius, only a stationary point is required here. This jig lets you cut circles from 20 to 72 in. in diameter, and then edge-sand them on the outboard disc sander.

The jig is easily made from three scraps

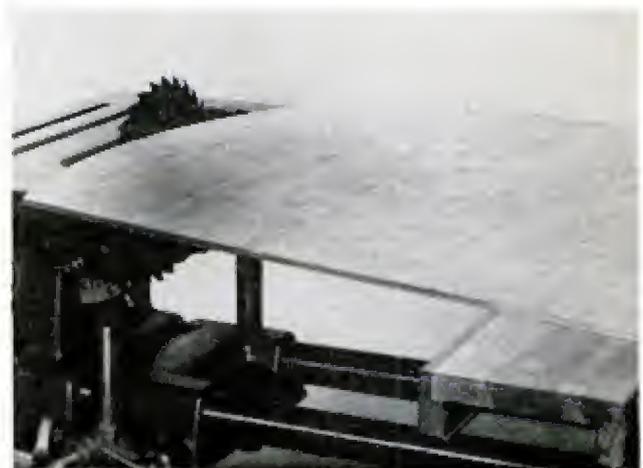


USE OF ADJUSTABLE JIG doesn't end with cutting. Edges can be smoothed by using jig with disc sander

of hardwood, assembled with glue and No. 10 F.H. screws. Rout a recess in the top face to sink the metal inset flush, and attach this inset with two screws. The center hole is tapped to receive the pivot point, made by grinding a 10-24 bolt to a long point and then cutting it off to leave just enough threads to pass through the plate. The other two holes are optional; they allow for predrilling the center hole of the disc when absolute accuracy is desired. Shoulder studs or bushings can be used to fit various sized center holes.

Attach the flat steel strips along the bottom edge of the sides to prevent the jig from tipping. Polish the sides of the extension table with emery paper for smooth sliding action. The castings that attach to the table may have to be filed slightly to allow for free sliding of the jig.

The dual-purpose jig is a versatile unit that you can use with both a band [\(Please turn to page 175\)](#)



LARGE RADIUS CUTS on plywood panels are possible with extension-table jig on Shopsmith. It's faster and more accurate than hand-guiding a sabre saw

Build a swimming pool just for the fun of it

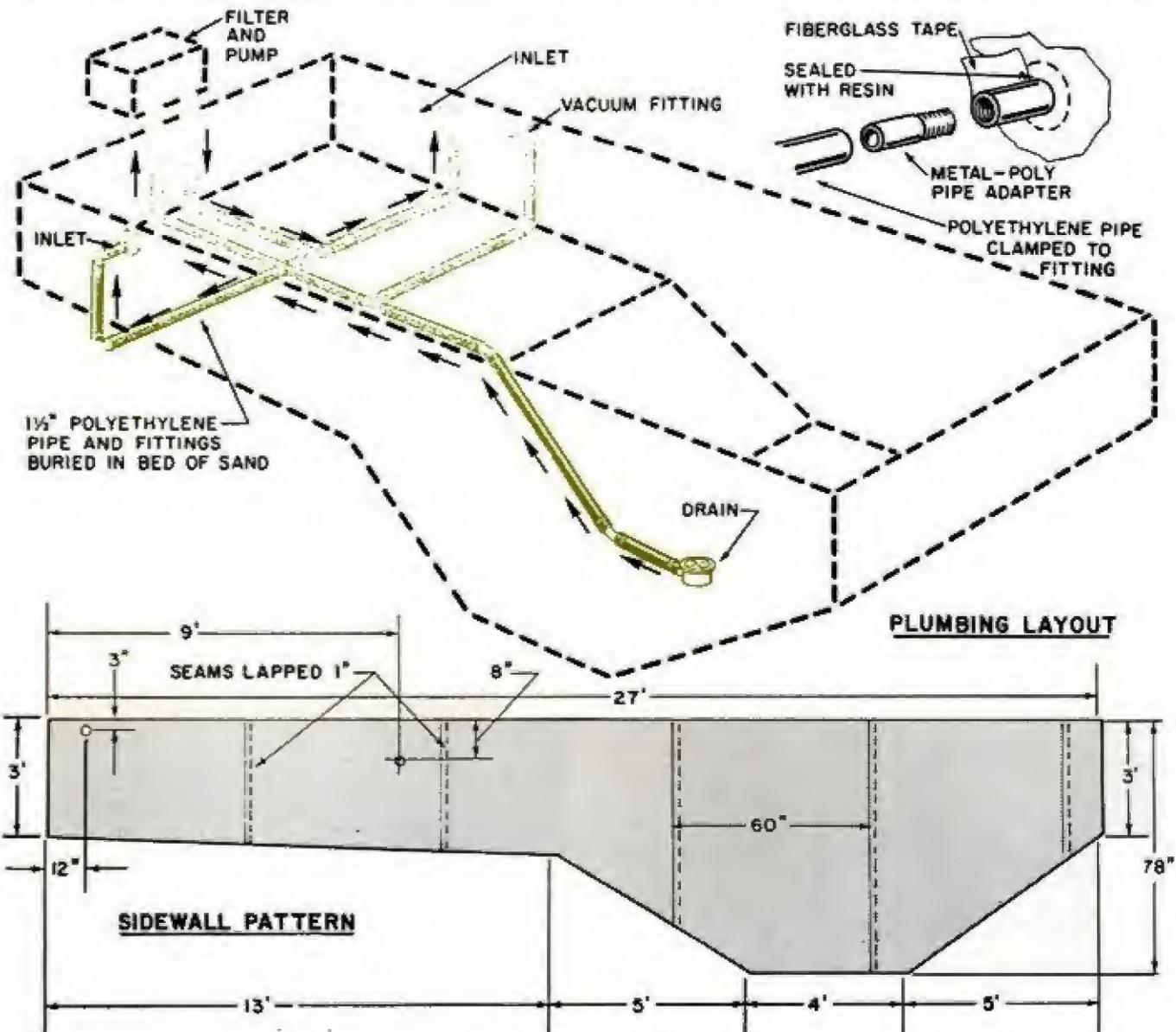
By digging a hole and lining it with a fiberglass shell, you can have the pool you've always wanted for as little as \$850, complete with pump and filter.

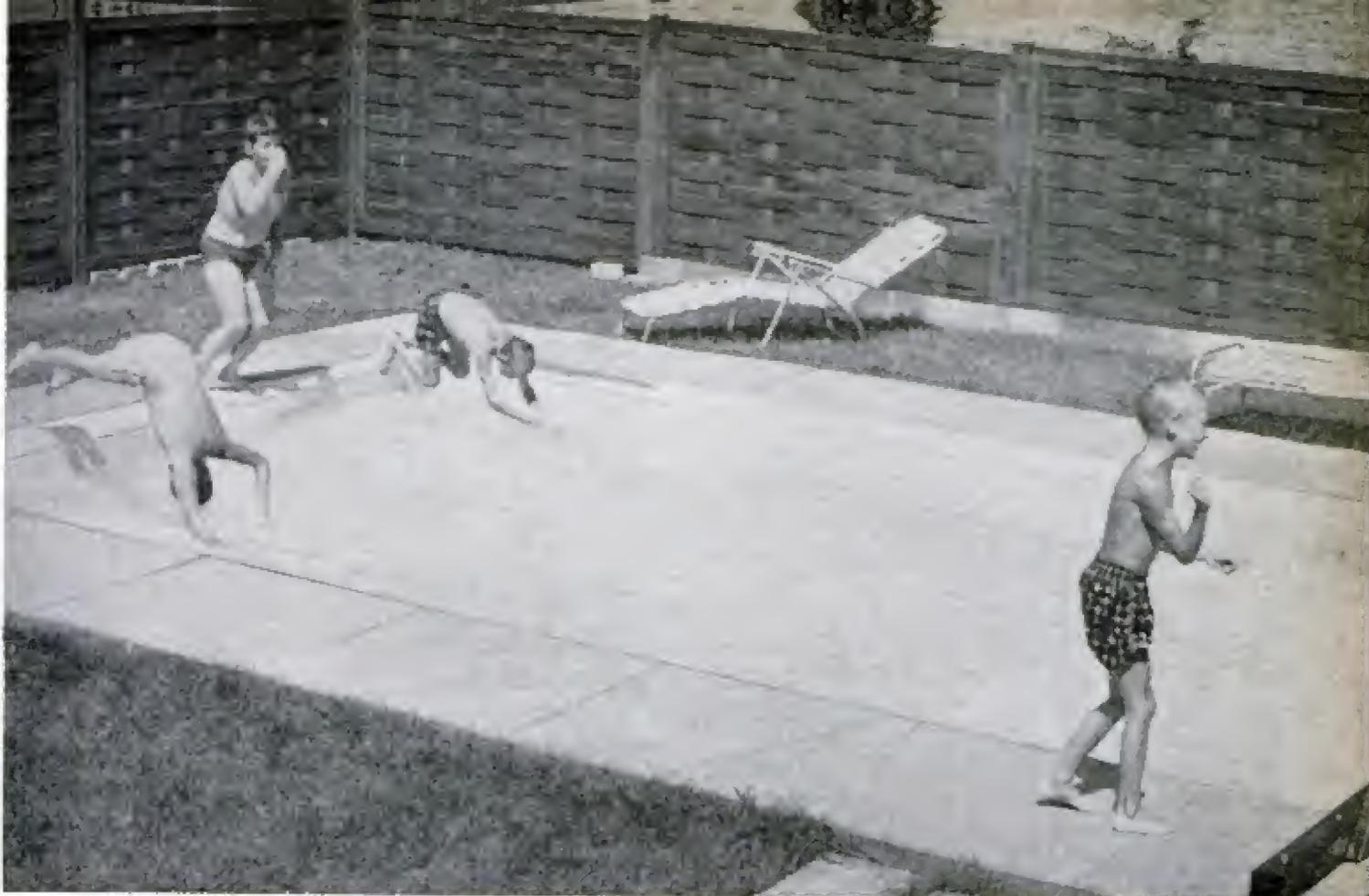
By Denton Wirkus

IF THE THOUGHT of building your own pool makes your head swim, you're in for a surprise. With a lightweight fiberglass shell that sets in the ground, you can build this fun-packed 12 x 27-ft. pool in less than 75 hours—it's that simple.

In starting out, we wanted to build the lowest cost pool possible, yet one that would give years of service. Second, we

wanted one that would be the easiest of all to build. Lugging heavy concrete blocks wasn't for me and besides, they're not cheap. By the time you'd pour footings and a bottom, a block pool of this size (lined with vinyl) would run close to \$2000; a pool of vinyl alone is less expensive, but it's subject to puncturing. So we decided on fiberglass as the cheapest, the





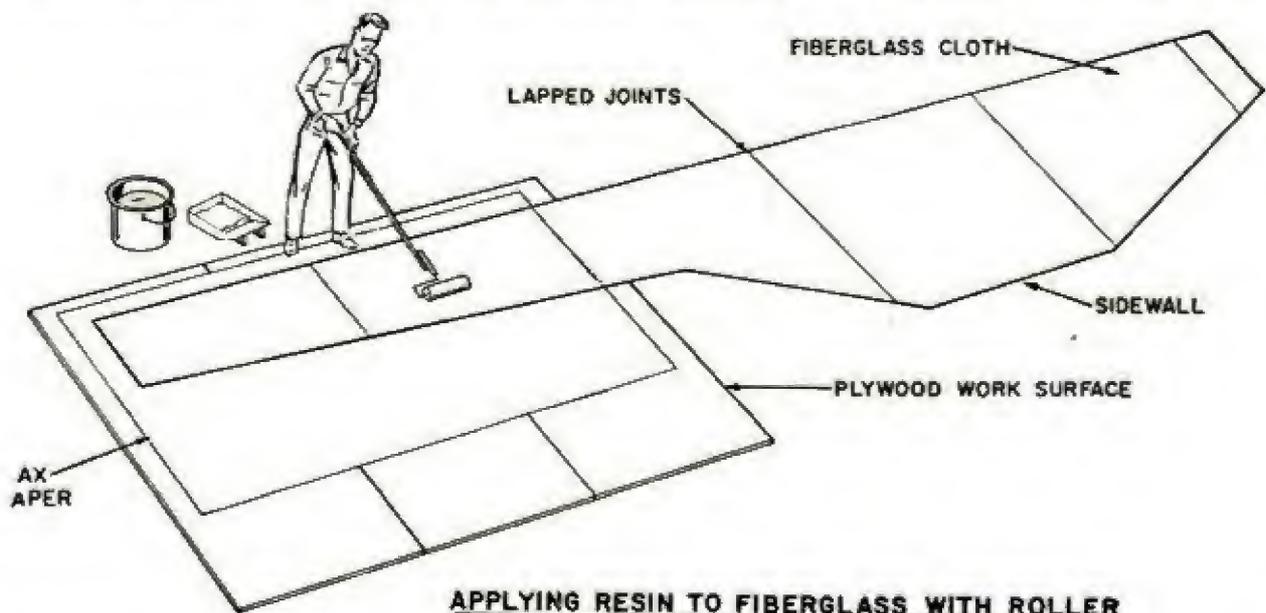
Ames Daily Tribune photo

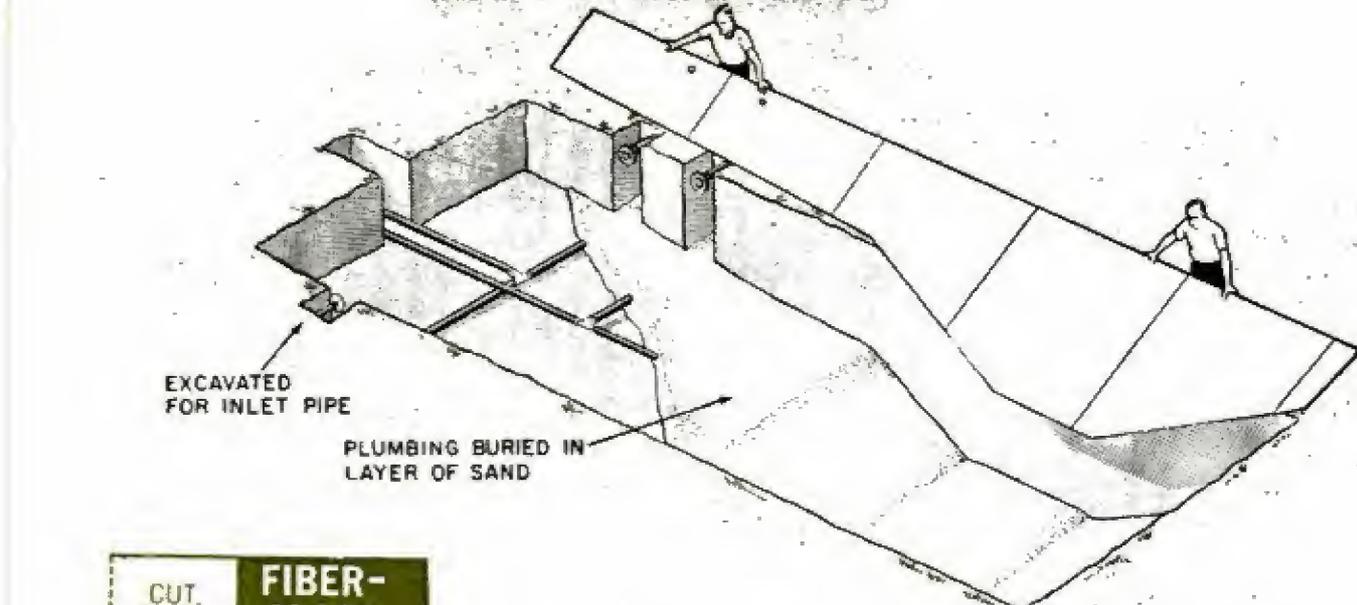
strongest and certainly the easiest material for anyone to handle.

No one in his right mind is about to dig the hole himself, so we hired out this job at a cost of \$110. The hole was dug just slightly oversize to keep backfilling to a minimum. The bottom was dug out as near to the pool's profile as possible with the power shovel and then we took over and carved out the deep end to the exact contour shown. You don't want to disturb any more of the firm soil than is necessary and, of course, you are way ahead where

the soil is compact enough to let you carve a hole that won't cave in.

When the excavation is completed, you are ready to install the plumbing lines. I used 1½-in. plastic pipe and regular chrome fittings (designed for concrete pools) for the drain, inlets and vacuum-cleaner outlet. These fittings are available from both Sears and Wards, as well as pool supply firms, and are joined to the plastic pipe with special metal adapters and stainless-steel clamps. After passing through the filter and pump, pool water is





EXCAVATED FOR INLET PIPE

PLUMBING BURIED IN LAYER OF SAND

CUT,
FOLD,
TAPE

FIBER-GLASS POOL

LOWERING FIBERGLASS SIDEWALLS IN PLACE

returned to the pool through the inlets. The drain fitting draws dirty water from the bottom of the pool.

The exact way the pipe lines are run is not important, outside of placing the drain at the deepest point and locating the vacuum-cleaner outlet far enough below the water level to insure that no air enters the line during the filtering operation. The sidewall pattern shows the hole for this fitting—9 ft. from the end of the pool and 10 in. down from the top. The two inlet fittings are mounted about 3 in. down from the top, one on each side and near the end of the pool to save on pipe. Both inlets lead directly to the filtering unit.

Since the drain, vacuum and inlet fittings are inserted in holes cut in the fiberglass liner before they can be connected to their pipes, the fittings must be left off until the shell is in place in the excavation. Where there isn't sufficient room on the outside of the shell to bring the pipes up the side, notches can be cut for them in the dirt bank. All pipe lines are buried in a 6-in. layer of sand which is spread

evenly over the bottom of the whole pool.

The $\frac{1}{16}$ -in.-thick fiberglass panels are all prepared outside of the excavation, flat on the ground. Sidewalls and endwalls are made in pairs, whereas the pool bottom is made up of four separate panels. The lining consists of fiberglass cloth which comes in rolls 60 in. wide. This is cut into pieces and then lapped an inch or so to make a panel 27 ft. long.

The cloth is made semirigid by saturating it with polyester resin containing a blue pigment and a hardening agent. Three 4 x 8-ft. panels of $\frac{1}{8}$ -in. hardboard, covered with wax paper to prevent sticking, make a good work surface for applying the resin to the cloth. I used a long-handle paint roller with a mohair cover to apply the resin, saturating the first section thoroughly and letting it harden an hour.

As each section hardens, the work is pulled part way off the work surface and another section is lapped along the edge, coated and left to harden. This is repeated to produce an unbroken sheet of reinforced plastic. A gallon of resin will saturate 18 to 22 sq. ft. of cloth, and since the pot life is short, you have to watch to see that you do not mix more than you can use in an hour's time. Instructions for mixing come with the resin. A second coat is applied after the first has hardened, to make the panel completely waterproof.

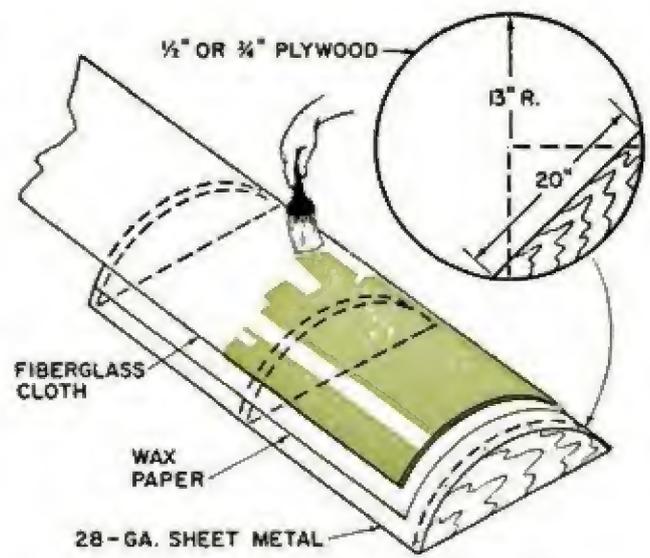
All panels are coated this same way and, while they're drying and curing, you can start making the curved fillet strips which are used to join the panels after they are lifted into the excavation. A curved form

Cost Breakdown

Filter, including pump and motor	\$225
53 yds. 60-in. fiberglass cloth, 42 gal. resin, 22 units pigment, solvent, rollers, sleeves	345
Fine sand for pool bottom	10
Polyethylene pipe, pool fittings, miscellaneous plumbing costs	100
Excavation and dirt removal	110
Building and plumbing permits	10
Ready-mix concrete for pool apron	50
	<hr/>
	\$850

is needed for this which is easily made by bending sheet metal to a 13-in. radius and nailing this to three plywood brackets. The form is covered with wax paper and then a piece of cloth 24 in. wide is placed on top of it, for coating. I made each fillet 5 ft. long, but you can make them longer if you wish. Each 5-ft. section is left on the form to harden and then given a second coat. You'll need approximately 100 lineal feet of these fillet strips.

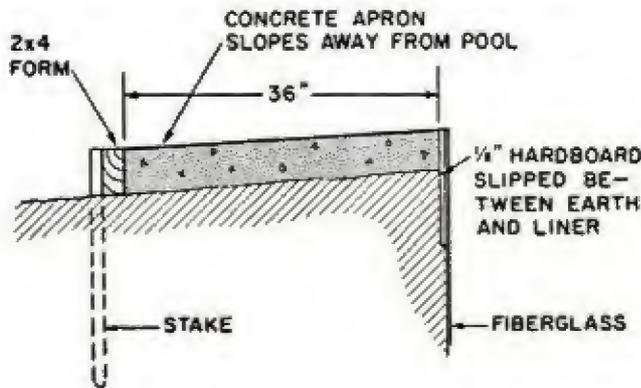
Short sheet-metal (aluminum) screws are used to attach the fillet strips to the panels, running pieces up the corners in joining the ends of the sidewalls, and along the bottom in joining the sides to the bottom panels. After this, all joints and screw-heads are covered with additional strips of cloth and saturated in place with a generous application of resin. Any roughness along the seams is sanded smooth after the resin has hardened. Thin as they are, the



APPLYING RESIN TO COVE STRIPS

bit. This can be poured right up to the shell by inserting 12-in.-wide strips of hardboard between the shell and the dirt walls to serve as an inner form. Staked 2 x 4s will do for an outside form. Scrap lumber placed crosswise of the pool will brace the hardboard against the pressure of the concrete. Here again, the pouring should be done after the pool has been filled. Finally, 12-in. strips of resin-saturated fiberglass are folded over the top edges of the shell and along the apron.

Filtering instructions come with the filter. Time to filter the water will run anywhere from 1 to 8 hours, depending on the swimming load, dust in the air and dirt in the filter. A screw-in plug in the vacuum fitting permits attaching the 30-ft. cleaning hose. Cleaning requires only 15 to 20 minutes once a week. ★★ ★



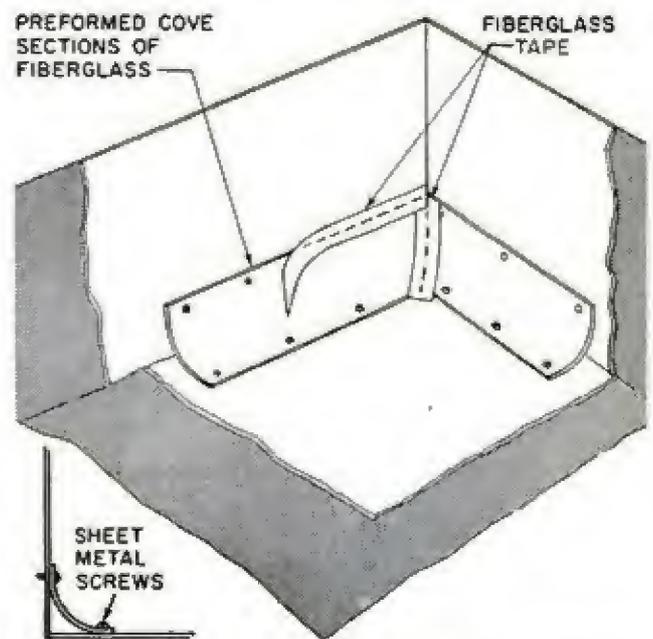
HOW APRON IS FORMED ALL AROUND POOL

fiberglassed panels are plenty strong to walk on and will flex a bit without fear of tearing or cracking.

Seams in the bottom panels are sealed in a similar manner with strips of cloth embedded in resin to insure no leaks. Inlet, drain and vacuum fittings are sealed in their holes with fiberglass tape wrapped around the back side and then generously coated with resin.

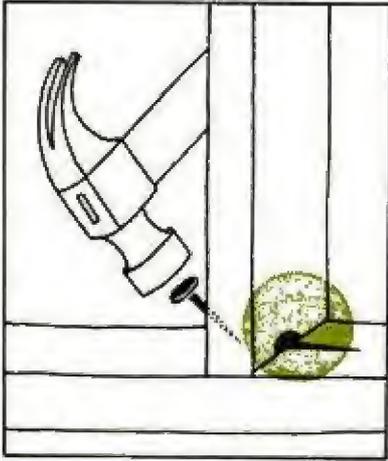
Backfilling the shell should be done gradually at the time the pool is being filled with water, so that water pressure against the walls can be equalized by the tamped fill. Unless absolutely necessary, the pool should not be drained over winter. The water level can be lowered some, but there is danger of the shell caving in without the constant pressure of the water.

To help keep the pool clean it's desirable to have a 3-ft.-wide concrete apron completely around it and sloped away a

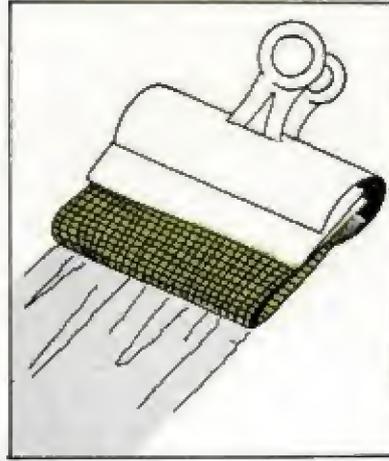


HOW BOTTOM AND SIDE WALLS ARE SEALED

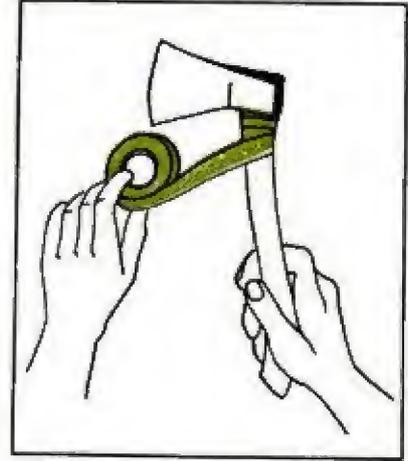
TIPS FROM READERS



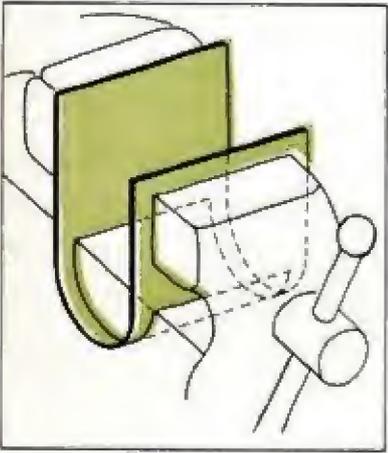
TO HOLD A STUD for toenailing, drive the head of a horizontal spike halfway into the sill on opposite side of stud as shown



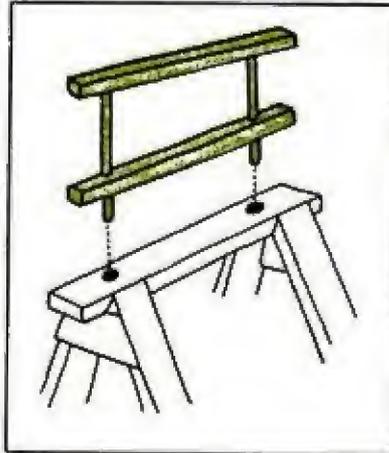
LOST YOUR GLUE BRUSH? A scrap of window screen, folded over, then gripped by a paper clamp, makes big-job applicator



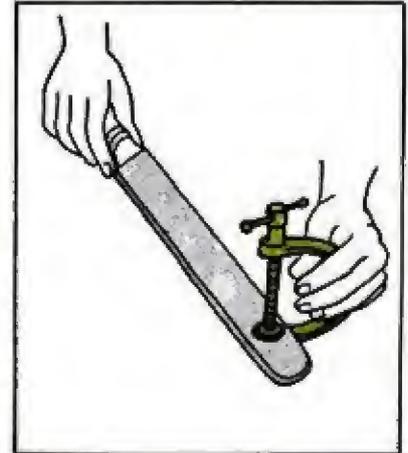
STRENGTHEN AN AX HANDLE at the "breaking point" by wrapping it tightly near the head with three or four layers of plastic tape



PADDED VISE JAWS won't damage gripped work. Thick leather pad with center cut out is U-bent to fit over vise beam, as shown



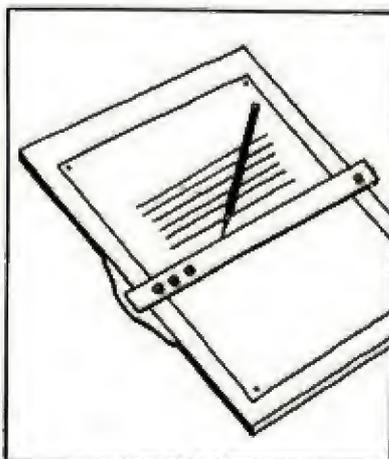
SUPPORT LONG BOARDS being cut on a bench saw with a jig of 2x2s and 3/4-in. dowels which fit in holes drilled in sawhorse



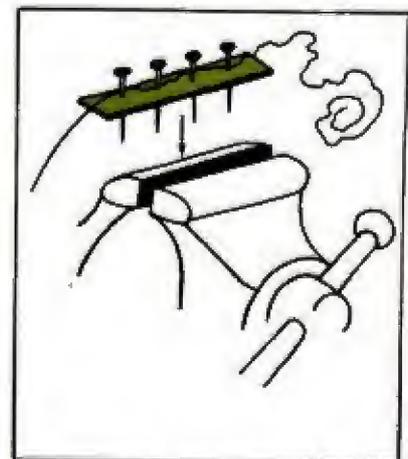
A C-CLAMP "handle" on the end of a file provides a better grip, better control, and keeps your hand off the file's sharp ridges



TO PAINT (both sides), and stack shelves for drying, nail scrap wood pieces to ends. Drive nails halfway for easy removal later



BETTER CONTROL of a T-square is achieved by drilling three finger holes through the T-square at positions indicated in sketch



STRAIGHTEN bent wire by snaking it between spaced nails held in a vise. Cardboard holds nails till vise grips them all at once



Pogo Shoes Give You a Lift

BY JACK WILEY

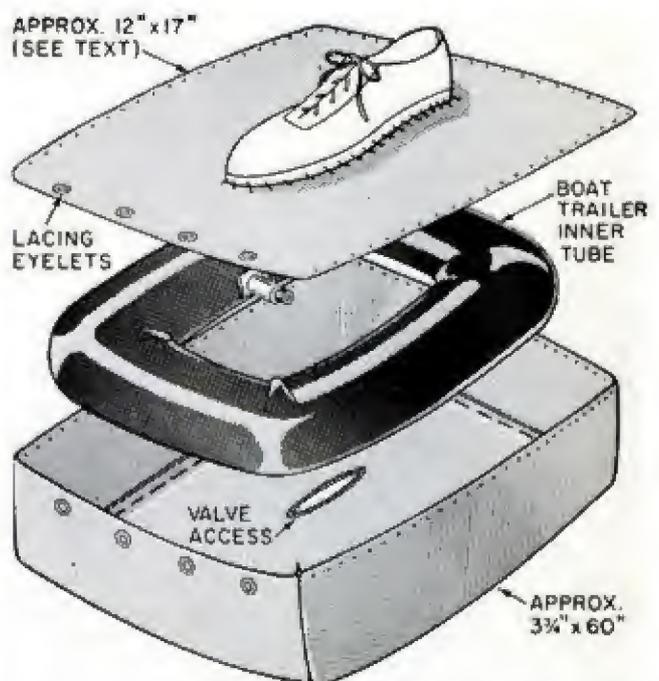
WITH BUNYANESQUE SHOES, it's now possible to literally bounce on air. They're so simple, it's a wonder no one came up with them before. They're safer, too, than conventional coil-spring jumping shoes. They consist of merely a pair of sneakers, canvas bags and small boat-trailer inner tubes.

Haul out that old pair of tennis sneakers and cut out the soles with a razor blade. From heavy canvas, cut the pieces shown at the right. Make the tops and bottoms about 7 or 8 in. wider and longer than your soles, which will serve as patterns on the tops.

Make the patterns for the rear and sides a little shallower than the thickness of the inner tube, about $3\frac{3}{4}$ in.

Cut a 3-in. lengthwise slit in the middle of the bottoms and stitch around it, as with a buttonhole, to reinforce the openings. This will provide access to the tubes' valves.

Place the tops and bottoms, with the gussets between, in inside-out positions and



stitch on three sides. When you turn them right side out, the seams will be concealed. Provide eyelets or small grommets in the front edges for lacing closed after the inner tubes are inserted. You're finished! ★★★

Beauty Treatments For Rusty Tools

By Walter E. Burton

WHETHER YOU HAVE a hobby of collecting and restoring old hand tools or just keeping your own shop tools bright and shiny, there are numerous beauty tricks you can perform in removing the "wrinkles" from corroded and rusted metal. These before-and-after examples show how such neglected tools respond to certain face-lifting treatments.

Rust-removing techniques range from cleaning with rust solvents to grinding down to clean metal with abrasive wheels or belts. Now and then, along comes a new method to make rust-busting easier.

One such for the initial steps in the job of face-lifting is a nonwoven nylon pad that is impregnated with an abrasive. First, you soak the rusty metal in a commercial rust remover for the specified time. Then, while the tool is still wet, you scrub off the loosened corrosion. Repeat to eliminate any stubborn spots.

For smoothing the steel, you can take to a steel-wire hand-brush or a wheel that mounts on an arbor of your grinder, drill press or electric drill. Or, you can use a brass-bristled brush, which does the job and imparts a faint brass plating to the tool. Still another method for smoothing is to use a buffing wheel charged with a

medium to fine-grit abrasive, such as tripoli or aluminum oxide. A final smoothing can be given with jeweler's rouge.

Generally, deep corrosion on steel leaves dark-colored pits and dull areas that are not easily polished out. They may not interfere with tool performance or comfortable use, but since we are launched on a beauty treatment, why stop here?

One easily applied cosmetic is a metallic-powder paint, such as aluminum or chromium paint. Dredge some pigment-rich paint from the bottom of the can and apply with a cloth. This fills the pits and leaves a thin metallic film on the surface. After it's thoroughly dry, apply a clear finish, but test it first to be certain that its solvent doesn't disturb the paint.

For filling large flaws, try tinning the tool with liquid solder. If you have the inclination and want to work with the acids and toxic chemicals involved, you might try electroplating (page 197, June '56, and page 191, July '56, *PM*).

When restoring an antique, like the old corkscrew shown, it's not necessary, or even desirable, to bring the metal to its original luster. Get rid of all loose rust and dirt, but don't file or grind away any of the remaining metal. Buff vigorously



1 RUST IS RUBBED OFF with a nonwoven nylon pad impregnated with an abrasive after being loosened in a commercial rust-solvent bath



2 SMOOTHING AND POLISHING is the next step. Here, a brass-bristled brush is used to even out the finish and slightly plate a plier-wrench



ARE THESE YOUR TOOLS? They may work in this condition, but the cutting edges are dulled and moving parts stick. This sorry lot cost 50 cents at an auction sale. The tack-hammer head has been partly cleaned

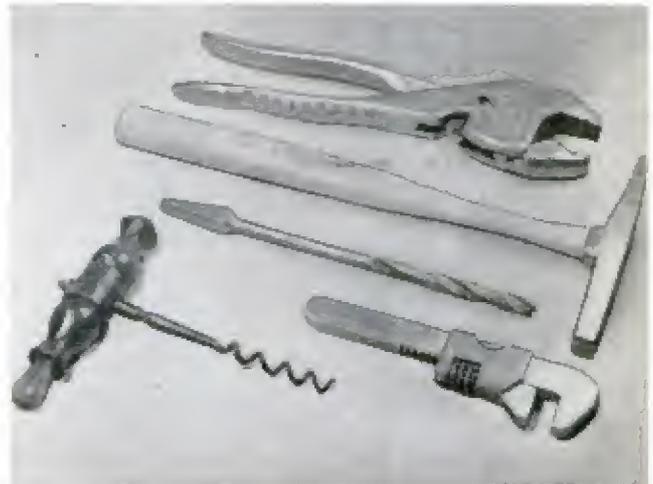
with a steel-bristled, suede-shoe brush and apply a protective coating of clear lacquer, shellac, boiled linseed oil or wax. Some of these may darken the metal.

Before tackling the metal, though, clean any wood parts, preferably with a solvent that doesn't raise the grain or destroy a patina of age. Paint remover is one, but

you may have to try several, depending on the existing finish and dirt. Lacquer thinner and alcohol also often work well. When clean, the tool can be rubbed with boiled linseed oil and polished. After it's dry, apply thinned shellac and buff it down with a cloth. For final protection apply two coats of furniture wax. ★★★



3 FINISHING STEP involves applying a metallic paint or solder to conceal blemishes and give the impression that the item has been replated



4 BEAUTIFIED, the tools are respectable and serviceable. Antique corkscrew was cleaned and lacquered, the others polished and painted

SOLUTIONS FOR MECHANICAL HEADACHES

AUTOMOBILE CLINIC

BY MORT SCHULTZ

Aided Reader Writes

You may recall that some time ago I wrote you of the troubles I was having with my 1962 Pontiac Tempest timing chain. You advised me to replace it with the company modification, Part No. 9772801. I did, and have now had this chain in since Feb. 1965. I have now put 21,000 miles on it without having it give me any trouble at all. I also put in slightly heavier spacers which permit a better arrangement on the chain side. Many thanks for the good advice.—Jim Reidy, Ventura, Calif.

My pleasure, Jim.

VW Valves Von't Vork

Our '63 Volkswagen won't retain a proper valve adjustment. It's been driven 37,000 miles with dealer maintenance every 3000 miles. The dealer sets intakes to .008 in. and exhausts to .012 in. Why won't the car maintain a valve adjustment?—B.A. Moss, Bluff City, Tenn.

First, your dealer better recheck the specs for this car. My little book says that all those valves should be set to .008 in.

If your beetle is not maintaining valve clearance, check out the rocker arm studs to make sure they're tight; if they're not, there's your trouble. By the way, there's a kit on the market that can be used to take up the play in the studs, thus eliminating the need for replacement. Ask your dealer or local auto parts outlet about it.

If the studs look okay, check the cam lobes. Loose lobes can also cause the valve setting to deviate. In this case, the only solution I know of is to replace the camshaft.

Normal It Ain't!

Our '64 Ford Fairlane sports coupe has a standard three-speed gearbox and a 289 V8 engine. Shortly after it clocked 13,000 miles, the car began slipping out of second gear when cruising down a grade under 40 mph and against compression. Our Ford dealer went through a lot of trouble trying to correct the problem. He tore down the transmission and replaced the input, output and needle bearings. Linkage checked out okay. However, the problem persists.

I've been told this problem was "normal" for this car, but I doubt it because I don't think my dealer would have gone to all

that trouble if it was. What do you think?—Graham Wilcox, Boise, Ida.

I think like you: It is not normal. You might softly suggest these two other possibilities to that gem of a dealer you describe: (1) you may have a bad synchromesh unit in the transmission; or (2) the transmission may be out of line with the bell housing.

Tire Wear on a Corvair

My car is a 1962 Corvair 700. Six months ago I put new rubber on the rear. Today the inside edges of both tires have worn badly. Viewing the car from the rear, I can see that the rear wheels slant in at the top. Any ideas?—Carl Rathje, Wyomissing, Pa.

Yes, and it seems this is a problem peculiar to Corvairs. I know of only one solution to it: replace the rear springs with heavy-duty springs which are carried by your Chevy dealer. The design of the '65 and '66 Corvairs makes this a fairly simple operation.

(P.S. If any of you guys have another cure for this malady, we'd like to hear about it.)

A Band Is a Band Is a Band

It says in the owner's manual for my '65 Olds Vista Cruiser with Jetaway transmission that I should have the transmission band adjusted at 24,000 miles, but the mechanics at the Olds dealer's where I bought the car say there's no adjustment to be made. What's up?—H.B. Smith, Winters, Texas.

I suggest you find yourself another shop. Like the manual says, that transmission band should be adjusted every 24,000 miles—period.

Falcon's Reluctant Shifting

My '62 Falcon with 170 engine and automatic transmission doesn't shift from low to high until I've driven it about 1½ miles after starting it cold. Once it heats up, it works fine. The trouble developed recently. I've changed the transmission fluid and diaphragm, even poured in an additive. Nothing helped. I'd appreciate a possible solution.—Mel Roth, New York City.

This is a pretty "popular" complaint, and the probable solution is one that all readers can paste in their hats and remember. Chances are the trouble is due to a sticky valve in the transmission valve body. When these get plugged up they must be removed and cleaned.

Un-Valiant Shifting Linkage

I'm having trouble with my '64 Valiant V-200 with standard shift. The shifting linkage rattles and is very loose. The dealer claims that it's a defect that can't be fixed. Is he right?—J.E. Thomas, Mondeville, La.

Nuts! While certain "bugs" can develop in any part of a new vehicle, the manufacturer is soon made aware of them and quickly issues service bulletins to the dealers which describe how to correct a particular problem. Here's the correction for *your* problem:

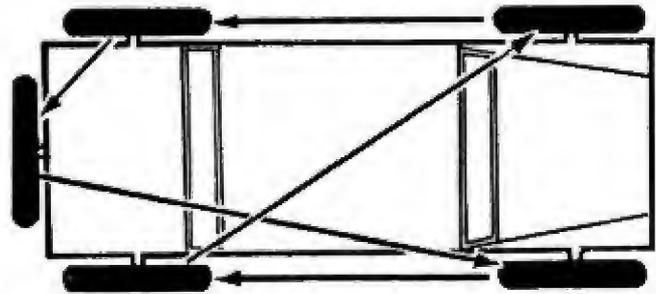
At the base of the steering column jacket (inside) are nylon bushings. You'll

find two capscrews there. Loosen them (don't remove them), then tap down on them. This action causes the shifting lever to tighten up on the bushings that are causing the trouble.

Rotating Tires

What is the accepted procedure for rotating the tires on a car?—Billie Jay, Carson City, Nev.

As follows, Billie: Right front to right rear; right rear to left front; left front to left rear; left rear to spare, and spare to right front (see sketch below).



Service Tips

- **DODGE THOUGHT IT IMPORTANT** enough to issue a TSB about it (D66-35), so we'll emphasize it too. All brake hoses on 1964, '65 and '66 Darts should be inspected for routing and amount of bend. There must not be more than a 15° bend in any of the front-wheel brake hoses. A greater degree of bend can cause interference on turns and lead to premature failure. Check these hoses the next time you take your Dart in for servicing.

- **OLDSMOBILE HAS SWITCHED** a fuse in its '65 models. It's the one for the dome lamp, courtesy lamps, clock and cigar lighter located at the lower left corner of the fuse panel. An SAE 20-amp. fuse was used in all models except those with rear-seat lighters. Fine. **But** an AGC 25-amp. fuse was used in those cars with the rear-seat lighters. **Not** so fine. The latter should be replaced with an AGC 30-amp. fuse.

- **THERE'VE BEEN A FEW BEEFS** about oil leaks at the parking shaft bore of '65 Pontiacs with Turbo Hydra-Matic. While this repair should be made by a professional, there's no reason why you shouldn't know the procedure so you can be sure it's done right. This is it:

1. The car is put on a hoist and the area around the parking shaft bore is brushed clean with a solvent.

2. A small amount of sealer (Part No. 1050026) is applied to a 3/8-in.-dia. cup plug (Part No. 8620318).

3. The cup plug is then placed in position with the open end facing the front of the transmission.

4. A 3/8-in.-dia. rod is then used to drive the plug into the parking shaft bore until it's flush with the case.

By the way, the nice thing about this particular repair is that it can be done without removing the transmission.

Each month Auto Clinic answers your questions on car repair. For a personal reply to a particular question, enclose 25 cents in coin to cover mailing and handling. Write to Auto Clinic, Popular Mechanics, 575 Lexington Ave., New York, N.Y. 10022.

Trailers and Campers Need Servicing Too!

By Morton J. Schultz

Now folks are buying the workhorse of the breed—the utility trailer. These are great for moving and hauling. Got one? Fine!

Here's how to keep it fine.

SAY "TRAILER" TO SOMEBODY and what image does the word usually evoke? Either a travel trailer or a mobile home . . . right? Yet many Americans own smaller trailers. Millions own boat trailers, for instance. And campers. And utility trailers—those all-purpose tow-behinds so handy for moving furniture, equipment and materials.

These small trailers deserve the same kind of care and coddling as their larger, more luxurious cousins, particularly as regards maintenance of tires, wheels, wheel bearings, lights and braking system (if there is one).

Needless to say, a trailer poses a lot fewer maintenance problems than the car that pulls it. Still, like a car, a trailer must be regularly serviced if optimum performance and safety standards are to be main-

tained. Best of all, servicing a trailer—unlike tackling many automotive repairs—is something anybody with a rudimentary knowledge of mechanics can do.

Start with the tires

Tire care. It doesn't require extrasensory perception to know when a tire—any tire—needs replacing. If either (or any) of your trailer tires are badly worn or cut, replace 'em with new ones.

Bear this in mind too: trailer tires rot faster than they wear out, because a trailer is often left "lying fallow" for long periods of time. If it's left on the greasy floor of a garage, tire deterioration will be accelerated. Gradual tire deflation will speed the process.

When a trailer is to be parked for a long time, park it on an oil-free surface, then



TO SERVICE BEARINGS: remove dust cap, cotter pin, adjusting nut, then wheel; pull bearing from spindle



USE A DRIFT to knock out inner bearing. Races of bad bearings should be knocked out and replaced too



U-Haul Rental System, Inc. photo

READY TO GO. Typical utility trailer is shown correctly loaded, with the weight concentrated at the front

jack it up (or put it on blocks) so that the tires *just touch* the ground or floor. Somehow, this slight contact with the parking surface seems to retard deterioration of the tire rubber.

Trailer tires must be inflated properly to insure safe trailering. So note this: the pressures in trailer tires must be *much higher* than the pressures you'd use in an

automobile tire of comparable size.

For example, what's the normal inflation for a 6.70-15, 2-ply car tire—26 lbs.? Maybe you go as high as 30 lbs., but no more. If you have 6.70-15 tires on your trailer, you should inflate them to 55 lbs. to insure safe towing.

The need for higher air pressure in trailer tires is fairly obvious. There is



"LOOK, MA, NO BRAKES"—on the utility trailer at the left. The one at the right, however, is equipped with an inertia-type braking system; to check out its wheel cylinders for leaking fluids, pull away the rubber as shown



FRONT END of inertia brake system on trailer tongue consists of master cylinder, shock absorber, springs

generally more weight concentrated on trailer tires than there is, proportionately, on a car's tires. Higher pressures help support that weight and keep the trailer on an even keel. Too-low tire pressure can result in side-to-side trailer sway that could become violent—and dangerous—at high speeds.

TABLE II (page 166) gives the recommended pressures for various sizes of trailer tires. Check it against the tire pressure you are currently using. The inflations suggested in TABLE II should be maintained whether the trailer is loaded or empty.

Check inflation when tires are cold, and deflate overinflated tires *only* when they are cold—never when they're hot. A tire increases its pressure as it runs and in that way protects itself against heat. So don't destroy that protection.

Those all-important wheels

Wheel balance. As you read in "What



TAKE A PEEK into the master cylinder to check the fluid level. Keep an eye peeled for leaks here too

You Should Know About Wheel Alignment" (page 180, Apr. '66 PM) an out-of-balance wheel on a car affects vehicle stability and riding comfort; but if a trailer wheel goes out of balance, the rig will actually hop, especially if it's light-loaded or empty.

Trailer wheels go out of balance statically, causing the trailer to vibrate vertically. Static rebalancing of trailer wheels is done in exactly the same manner as it is for automobile wheels. A trailer wheel should be rebalanced whenever you replace one tire with another.

Wheel bearings. Under ordinary circumstances, wheel bearings should be serviced once a year. However, if you have a boat trailer which is often rolled into the water—especially salt water—these bearings should be serviced every few weeks during the boating season.

A technique for lubricating trailer wheel bearings without having to pull the wheels is to have a grease fitting tapped into each



CHECK TRAILER BRAKE LININGS with a lining gauge. Replace the linings if they are less than $\frac{1}{16}$ in. thick



HOW ARE BRAKE DRUMS? If only slightly damaged they can be turned, but replace badly scored drums



CHECK LIGHTS with trouble light. Hook to car, touch prod to trailer; if tester lights—bad ground

hub. Then you can grease the bearings with a hand gun whenever they need it.

Worn or damaged wheel bearings in your trailer will cause it to track poorly and sway from side to side like a drunken camel. When they get *really* bad they can even shear off a wheel.

To get at wheel bearings for inspection or servicing is a fairly simple job, as can be seen in the photographs at bottom of page 162. In adjusting the bearings after they've been serviced, run up the adjusting nut until the wheel's tight, then check for end play. If there is play, turn the nut tighter. When end play is eliminated, back off the nut to the next notch, then insert the cotter pin.

How's the suspension?

Springs. Make sure the springs are tight and have no broken leaves. Push the trailer from side to side. If a spring is bad and needs to be replaced, you'll notice an unusual amount of "play" as the trailer is



WIRING HARNESS carries current from car to trailer lights by means of simple male and female connectors

swayed. By the way, this is one trailer repair job that can be a knuckle-buster, especially if the bad spring has become "frozen" at its connections. You might be smart letting a pro tackle the replacement.

Be sure you can stop it

Brake system. Most boat and utility trailers, being relatively small, do not have those self-contained braking systems called *inertia brakes*. These small rigs rely on the braking power of the towing vehicle to stop them. However, some trailers do have these systems which tie into the towing vehicle through the ball hitch. It works like this:

As the towing vehicle slows, the inertial force of the trailer exerts pressure against the ball. This in turn forces the fluid in a master cylinder through the brake lines and thence to the wheels where conventional hydraulic principles serve to brake the trailer by activating brake shoes on the wheels.

A trailer's braking system presents a fair number of parts to check on. These include:

- The master cylinder (for fluid level and leaks).
- Shock absorbers and coil springs (for adequacy of tension).
- Wheel cylinders (for leaks).
- Brake linings (for wear).
- Brake drums (for damage, such as scoring).

Inspection and maintenance of the brake system should be done once a year. Do it at the same time you pull the wheels to check the bearings.

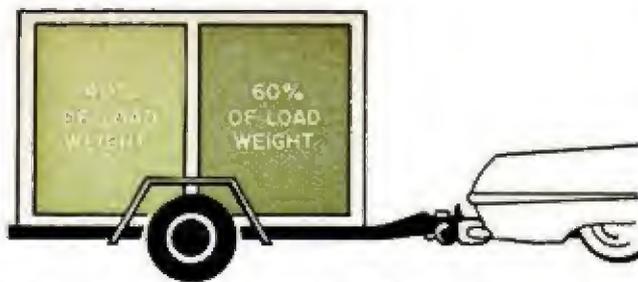
Don't forget the lights

Lighting system. A trailer will have three or four wires leading to it from the car. One wire will go to the trailer's tail-lights, and two to the (turning) signal lights. There may be a fourth wire for the ground, though in some trailers the ground is established by metal-to-metal contact of ball to hitch.

Trailer lights fail for any of three reasons: a bad ground, burned-out bulbs or worn wiring.

You can check the condition of the ground with a test lamp. Hook one wire of the lamp to the tow vehicle's bumper, then touch the prod to trailer metal. If the test lamp lights, you have a bad ground.

In the case of a trailer grounded through



PROPER LOAD DISTRIBUTION FOR A UTILITY TRAILER

the ball, the poor ground is probably due to corrosion or dirt around the trailer's ball-and-socket hitch. Clean these connectors, using an abrasive if necessary.

If there's a ground wire, remove it at the ground connection and make sure the connector and ground-wire terminal are free of corrosion and dirt. Then reconnect it and try again. If the ground still proves faulty, replace the wire.

Trailer wires are generally supplied in harness form; thus, to replace one you must replace all. One end of the harness

TABLE I. Maximum Controllable Speeds

Trailer Size	Open Rig	Closed Rig
4' x 6' single axle	65 mph	65 mph
4' x 7' single axle	60 mph	60 mph
5' x 8' single axle	60 mph	55 mph
6' x 8' single axle	55 mph	50 mph
5' x 10' single axle	50 mph	45 mph
5' x 12' tandem axle	45 mph	45 mph
6' x 14' tandem axle	45 mph	45 mph

hooks into the car's lighting system; the other is connected to the trailer by means of a connector plug.

When towing a trailer at night, the importance of reliable, working taillights cannot be overemphasized. Always check them before you pull out onto the road. Also, carry a spare bulb or two and a couple of spare fuses—just in case.

... and tow with confidence

Loading and towing. A trailer must be loaded so there's a 60- to 40-weight ratio between front and back. In other words, 60 percent of the load must be concentrated at the front of the trailer so it bears on the rear of the tow car. If the load is centered over the trailer wheels or is concentrated in the rear, the trailer will tend to whip from side to side, especially when towed at high speeds.

For any trailer-towing car there is a speed beyond which the driver will be unable to control the vehicles. This limit is known as the maximum controllable speed (see TABLE I at left). For everybody's sake—your own included—*don't exceed this speed.*

Remember, too, that no matter what the maximum controllable speed happens to be for your rig, the *legal speed* for a car with trailer is *the same as the posted speed limit for trucks.*

Finally, be sure your own car is in top condition before you put it to work hauling a trailer. It just wouldn't make much sense to tow a tip-top trailer behind a ruffraff car. ★★★

TABLE II. Tire Information for Utility Trailers

Tire Size	Ply Rating	Maximum Trailer* Load	Inflation
4.80/4.00-8	2	380 lbs.	30 lbs.
	4	600 lbs.	65 lbs.
4.80/4.00-12	4	790 lbs.	65 lbs.
5.70/5.00-8	4	710 lbs.	50 lbs.
	6	900 lbs.	75 lbs.
	8	1030 lbs.	95 lbs.
5.30/4.50-12	4	915 lbs.	55 lbs.
6.90/6.00-9	4	850 lbs.	40 lbs.
	6	1080 lbs.	60 lbs.
	8	1275 lbs.	80 lbs.
	10	1450 lbs.	100 lbs.
6.00-12	4	1010 lbs.	40 lbs.
	6	1290 lbs.	60 lbs.

*This figure is the maximum load that can safely be placed on each tire. Double maximum trailer load for a 2-wheeled trailer; quadruple it for a 4-wheeled trailer.

AUTO TIPS

FROM PM READERS

Sandbagging a patch

- When using patching fabric, with adhesive, to repair small holes and rips in a convertible top, cover the patch with an emptied sugar or salt bag partially filled with sand. The bag will conform to the shape of the top and hold the patch in place until the adhesive dries.

Masking wire spokes

- Tired of tape-masking those wire spokes every time you want to paint the wheels? Try this: split one side of the required number of soda straws right down the middle with a razor blade, then snap a straw around each spoke (a bit of tape may be needed at the ends). When you're finished spray-painting, pull the straws off.

"X" marks the light

- Carry a roll of reflective tape in the car in case a headlight dies on you some night. Make an "X" of the tape over the darkened lens to help oncoming drivers discern which side of your car has the light, thus enabling them to pass you safely.

For easier timing

- When timing marks on an engine are difficult to read, thoroughly clean them, then apply thin stripes of luminous paint

to 'em with an artist's brush. The marks will stand out under the timing light.

Target—tar

- If wet tar from a newly covered roadway is flung against your car's finish, remove it safely by daubing the tar spots with lard. When the lard soaks in, the tar can then be wiped away.

Funneling with a tube

- A funnel is handy when you want to pour liquid additives such as valve-freeing and moisture-removing stuff into the gas tank. Otherwise, cardboard from a roll of waxed paper or aluminum foil will serve as a substitute.

To remove a stud . . .

- Here's how to remove a stud without damage to the threads: run two nuts down on the stud until the top nut is flush with the top of the stud. Lock the two nuts together firmly. With a wrench on the lower nut, turn out the stud. The two nuts are then easily removed with wrenches.

Removing dents from doors

- To remove dents from the lower half of car doors, insert a long punch or pry bar up through a water hole. Then use the bar to pry out the dents.

NEXT MONTH IN SHOP AND CRAFTS

KEEP SHARP. For efficient cutting edges, it's important to know which honing stone to use on what tool. Next month we show you how to choose and use the proper shape and grit of stone for chisels, plane blades, carving knives, sickles, shears and bits. There'll never be a dull moment around your house once you master these tips

DOCTORING A DUNKED OUTBOARD. It's bound to be a big headache, but knowing what to do from the first moment that soggy motor emerges from the water can mean the difference between minor overhaul and major disaster. It's all in next month's **PM**—from "what to do until the mechanic comes" to stripping down a wet engine

SULKY FOR YOUR ROTARY MOWER. While a self-propelled mower beats one that you have to push, it still doesn't take the walking out of mowing. This power sulky hitches on behind to help push as it lets you ride in lazy-man style. You'll find complete plans in the June **PM**

TRICKS OF AGING FURNITURE. Making furniture look old before its time is an art that can fool the most savvy collector. Beating the surface with a bunch of keys, rolling it with a broken grinding wheel and wiping it with tobacco juice are a few tricks of the trade used by the pros to "age" Colonial reproductions

Build a FANTASTIC CONELESS LOUDSPEAKER! Here are the complete plans that you asked for after reading about this amazing speaker in our December issue

HERE THEY ARE—complete instructions by William Ashworth for building one of his coneless loudspeakers (page 36, Dec. '65 PM), as requested by many readers. Once you have the know-how, this speaker is surprisingly easy to put together.

Some of the parts needed to build a coneless speaker may be difficult to obtain, and, for this reason, Ashworth will supply kits of parts for these speakers for \$3.95 each (see parts list on page 170 for address).

The kit will contain a C-frame (the mounting bracket) complete with the 2-inch disc spot-welded to it. It also includes the coil, which consists of 4000 turns of No. 37 enameled wire, such as Formvar. Then there are the 37 half-inch silicone steel E-laminations, the brass, gap-spacing spring and the adjusting screw with two locking nuts.

Epoxy cement and solder are also needed to assemble a speaker, but these are not provided with the kit.

Important note: In the original story we stated that this speaker would cost only 38 cents to make. This price was a manufacturer's cost when turning out several thousand units using automated ma-

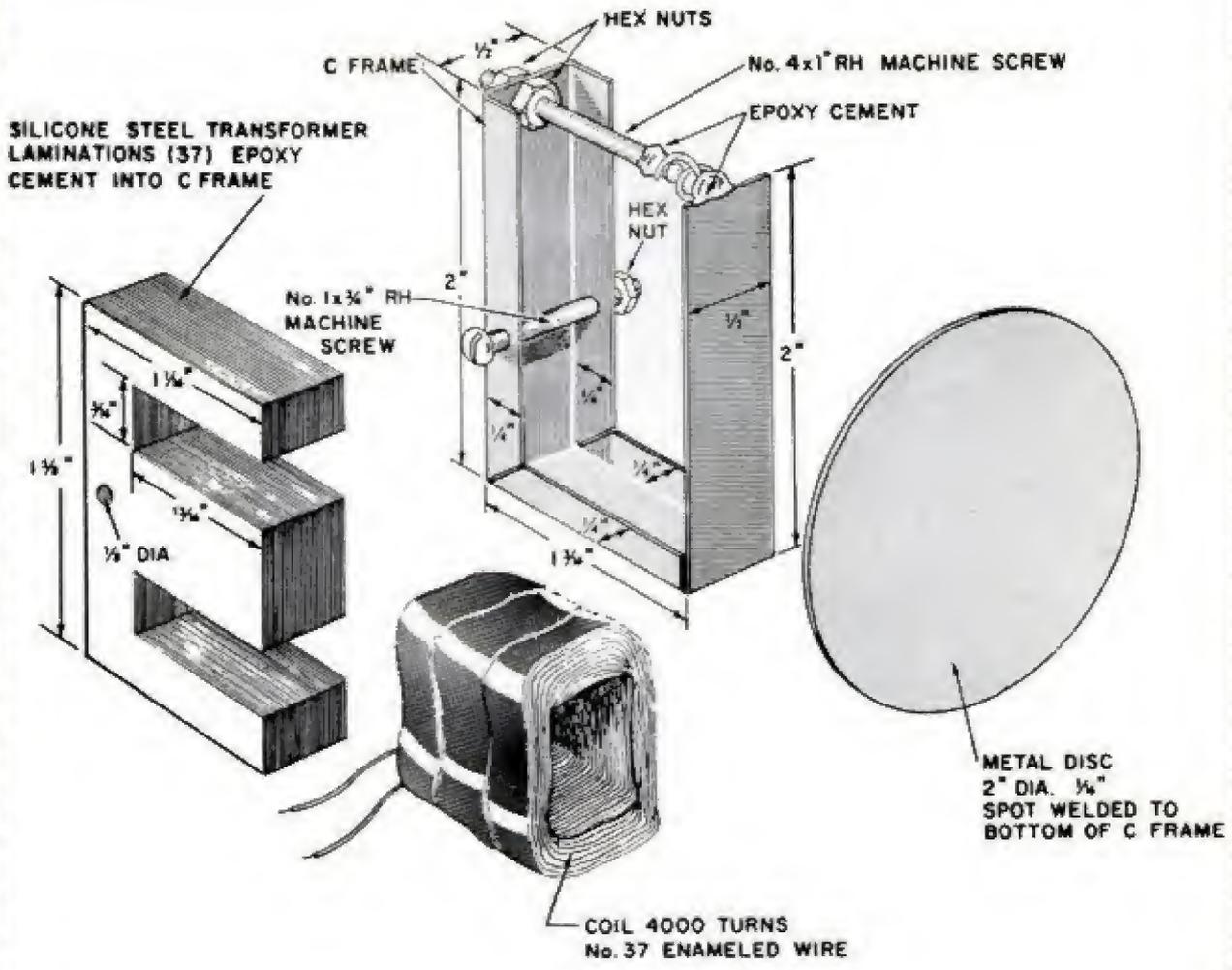
chinery. Obviously, in smaller quantities the materials cost more.

Once you have the parts you need, assembly begins. Start by bending the C-frame into its final shape but do not bend the side of the frame with the disc until later. Then with epoxy cement, fasten the laminations into place. You can insert a small screw through the holes in the frame and laminations to hold them firmly in place while the cement sets. When the epoxy is dry, slide the coil onto the center shaft of the laminations. Make sure the coil leads come up from the top.

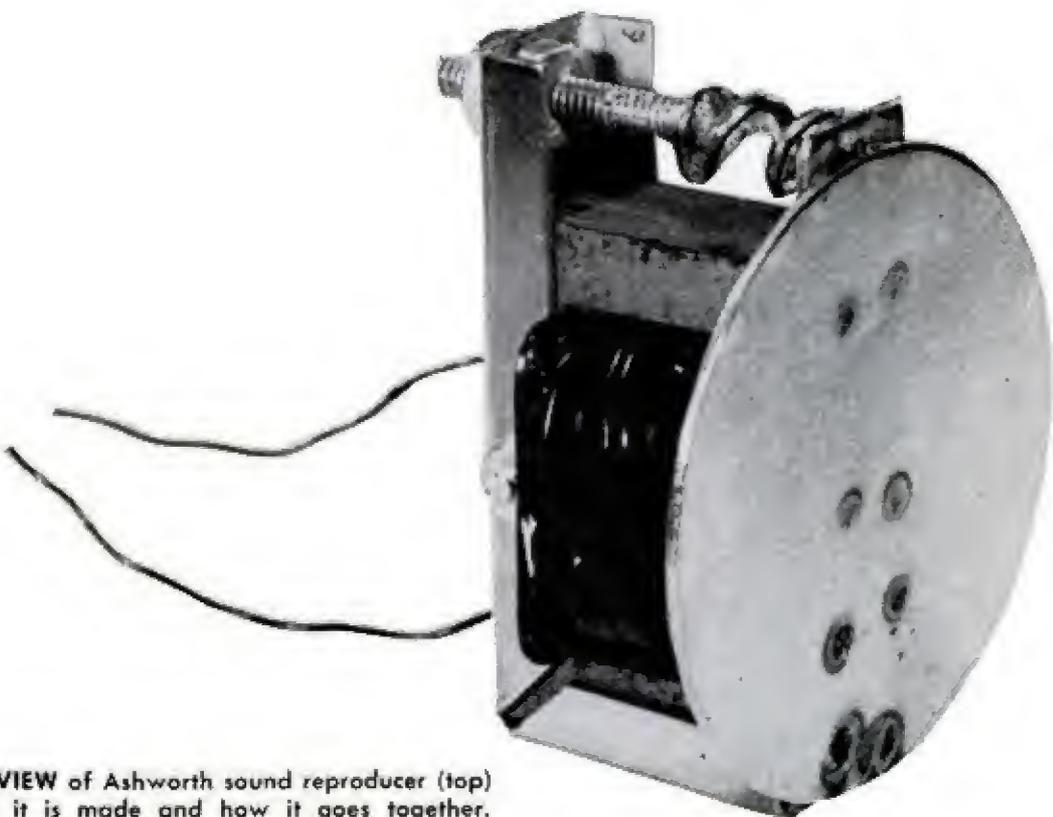
Now you can make the final bend on the frame. Then solder or epoxy-cement the head of the adjusting screw to the brass spring. Solder or epoxy the free end of the spring to the end of the C-frame fastened to the 2-in. disc. Again you'll have to wait for the cement to harden.

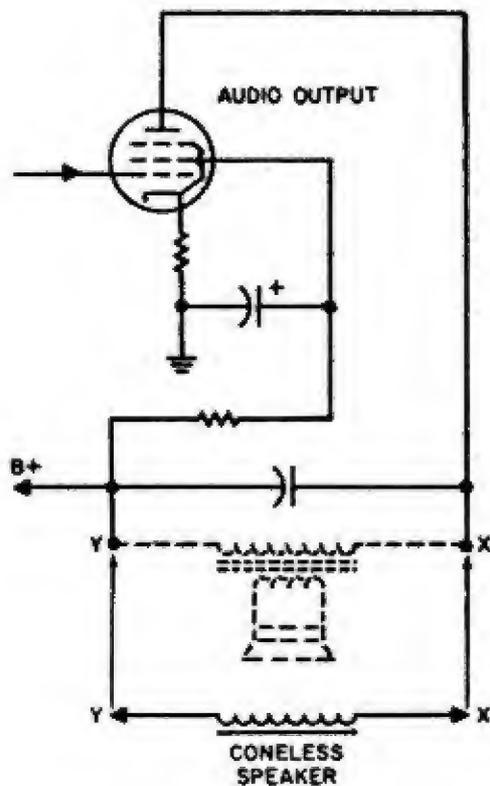
The next step is to put the locknuts into place but do not tighten them at this time. The speaker is now assembled. Connect it to an amplifier circuit as shown on page 170. With amplifier on, adjust the gap spacing for maximum volume with no metal-to-metal contact between the flat C-frame arm and the bottom of laminations.

This unit is designed for vacuum-tube



EXPLODED VIEW of Ashworth sound reproducer (top) shows how it is made and how it goes together. Laminations are glued in place with epoxy before the coil is slipped on. The sound reproducer disc is welded to the bottom leg of the "C" frame. The completely assembled speaker unit is shown at bottom right





CONNECT THE CONELESS SPEAKER into an amplifier circuit following this diagram. You'll note that it replaces the primary of an audio output transformer

amplifiers and, as the schematic (above) shows, it is connected in exactly the same way you would hook up the primary of a standard audio output transformer. In other words, the Ashworth unit is connected directly between the B-plus supply line and the plate of the output tube.

How can you best use a coneless speaker? The possibilities are almost endless. Here are a few of them. Please note that in all applications the 2-in. disc is cemented to the surface you wish to use as the sounding board.

In a child's record player, cement the disc to one side of the case. This makes the entire case a sound-producing element. You'll be surprised at the improvement in the sound.

If you cement one of these units to a wood door or the rear of a large plywood panel, the entire door or panel becomes a sound-producing source. You can do the same thing with most hard materials—such as doors, mirrors, windows.

If you connect the speaker to the bottom of a coffee table, the tabletop will become a speaker.

Among early proposals for potential coneless loudspeaker applications was one

from a discotheque operator who said he could use it to turn his dance floor into one giant speaker so that dancers would then feel, as well as hear, the music. Obviously, this will take a much larger unit, but he might just be able to do it.

If a deaf person holds one of these tiny speakers in the palm of his hand, he will feel the vibrations of music and speech. (*Caution note:* Beware the high voltage. Make certain a unit so used is well insulated by wrapping electrical tape around coil, laminations and top of C-frame.) This could become a very helpful aid in teaching such people to dance and talk.

We are sure that many more possible uses for this amazingly adaptable device will come from our readers. If you discover an unusual application, drop a line to our electronics editor and tell him what you've accomplished with the Ashworth sound reproducer.

The unit that has been described here is designed to handle up to five watts of audio signal. For greater power output the entire unit must be scaled up. We have no plans or instructions for this, but here is another area open for some interesting experimentation.

Only limitation is frequency response. The top, about 6000 cycles, isn't hi-fi but it's more than ample for speech, AM radio, intercoms or a child's phonograph.

For a final word of caution: Always be certain that the leads going to the coneless speaker, as well as the speaker itself, are carefully insulated. Remember, the coneless speaker is connected in the B-plus circuit, which can carry up to 200 v. d.c.—a dangerous level of electricity.

PARTS LIST

- C-frame**—made from piece of 1/16-in. steel as shown in exploded view, page 169
- Sound-reproducer disc**—2-in. dia. x 1/16-in. sheet steel
- Transformer E-laminations**—37 pieces silicone steel shaped as shown in exploded view
- Coil**—4000 turns No. 37 enameled wire
- Adjusting screw**—No. 4 x 1-in. RH machine screw with 2 hex nuts
- Lock nuts**—No. 4 (2)
- Lamination holding screw**—No. 1 x 3/4-in. RH machine screw with hex nut
- Compression spring**—1/2-in. spiral brass
- Epoxy cement**
- Solder**

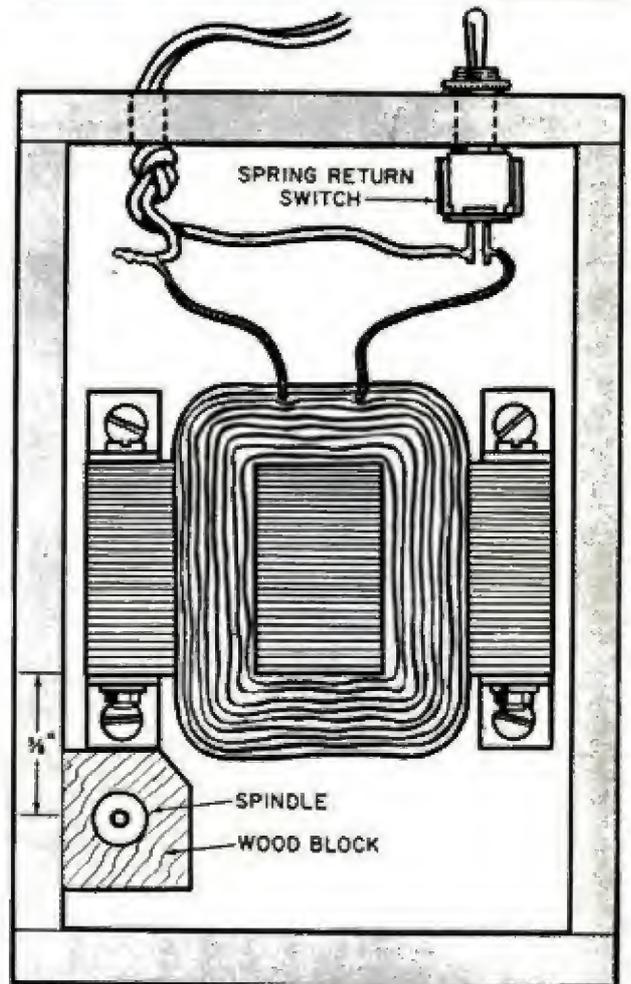
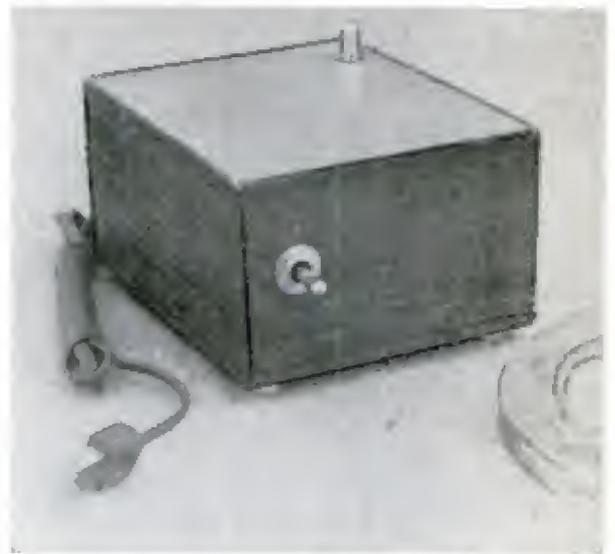
A complete kit of parts, less epoxy cement and solder is available from William J. Ashworth, Ashworth Research & Development Laboratory, Highway 78 East, New Albany, Miss. The cost is \$3.95.

ELECTRONIC KINKS



Increase tape recorder battery life. Get 8 to 10 times the recording time before a battery change is required by using a heavy-duty battery to replace the tiny 9-volt unit normally used. Or, you can make a battery from six pen-light cells connected in series. Add connectors to couple the pack to recorder and you're done.—*John W. Connors*

JUNE 1966



Build a bulk tape eraser. Start with an old power transformer from a TV set. Take it apart, being careful not to damage the coil. Separate the laminations; then reinsert them in the coil, making sure all are turned the same way. Fit in as many as possible. Mount in a wood box and hook up switch and a.c. cord as shown.—*Cecil H. Avery*

171

Put it in the sun and watch it spin

By Robert Bramms and Max Parnes

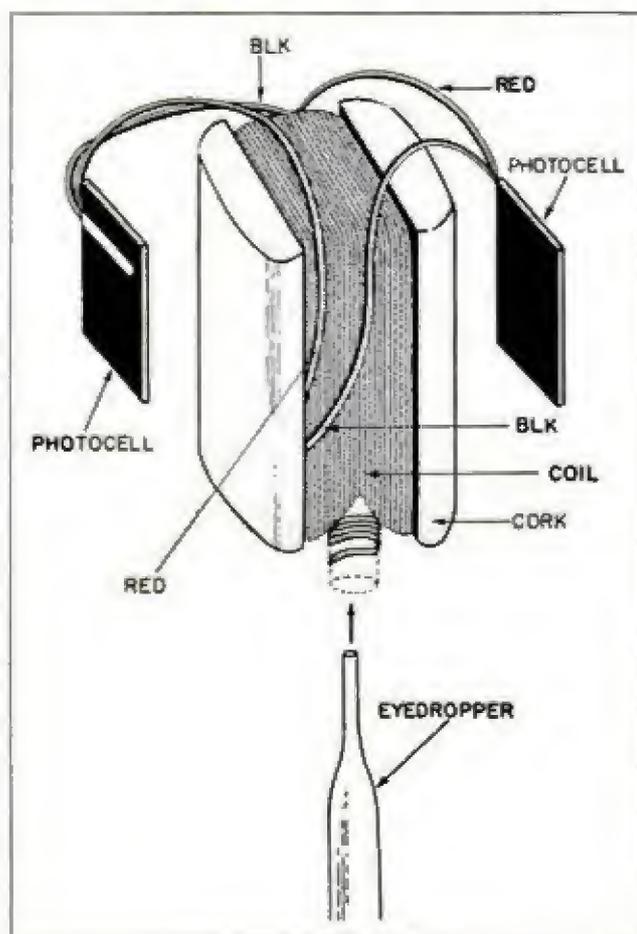


FINISHED MOTOR ready to run is shown above. Put it in direct sunlight and give it a starting spin and it goes like mad (below). Exploded view (below right) shows how it is assembled. Photocells are cemented to sides of cork. Any large heavy-duty magnet will work

POWERED BY THE SUN, this ultrasimple electric motor is easy to build and fascinating to watch in operation. Cut base about 4½ in. square from ¾-in. stock. Grind one end of a 3½-in. length of coat-hanger wire to a tapered point and drive it through the base. Drill a hole to fit the wire through head of a heavy-duty, horseshoe-type alnico magnet; place it on spike.

Now, drill a ⅜-in. hole through a large bottle cork to fit an eyedropper tube, then cut a ⅜ x ⅛-in. groove endwise around the cork and insert tube, pointed end up. Wind 350 turns of 32-gauge enameled wire in the groove and take a few turns around the dropper to hold it in place. Connect coil ends to the leads from two B2M photo-cells, as shown. Cement cells to opposite sides of cork, then place armature assembly over the spike.

Set the motor in direct sunlight, start it spinning and watch it whirl. ★★★





America's
#1
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**Get a pocketful of great taste
and rich aroma. Pipe tobacco
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(You'll like 'em fine...and that's putting it mildly!)

**Since all vans these days
are pretty much the same price,
how do you pick out the best?**

Check the name.

The most important name to you is **GMC**. These three letters stand for three things. Built, sold and serviced by truck people. That's the difference between Handi-Van and the others. A mighty important difference, you'll agree.

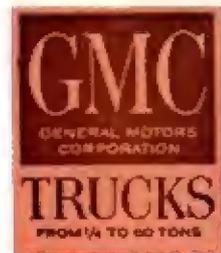


Giant rear doors make for easy loading and unloading. Virtually the whole rear end of Handi-Van opens up, to simplify your job.

Handi-Van's underbody has been specially treated to resist rust and corrosion. All critical joints are sealed. Rugged construction like this saves money. Also, low initial price and economical operation give you a van that'll help you make money every year you own it.

Load space galore. Handi-Van measures 211 cu. ft. inside. That'll hold over a one ton payload, 2,200 lbs. to be exact.

The engine is a 6-cylinder, 120-h.p. engineering gem. If you want more muscle you can specify a 140-h.p. work horse.



Vehicles may be shown with other than standard equipment.



3 JIGS FOR CUTTING DISCS

(Continued from page 151)

and a bench saw—or with a disc sander. The pivot-point yoke lifts off to expose a lumber roller that'll offer you a "third hand" when you're ripping long stock.

This free-standing unit must be rigidly anchored to be of service, so a heavy base is essential. I obtained the base shown on page 150 from a medical supply store; they were happy to sell it for next to nothing because it's outmoded. If you're less lucky, you can make a heavy base from scrap metal—such as a discarded brake drum—or from plumbing materials—iron pipe and fittings—increasing the weight by pouring in melted lead.

The locking screw for my telescoping stand is a short piece of threaded rod screwed into an old TV knob and turned into a tapped hole through the 1¼-in. pipe. The 1-in. pipe is attached to the base of the assembly with a floor flange.

Making your roller

If you have a readymade roller, buy whatever bearings you need to mount it. If you make a roller, as I did, you'll need bearings that will take a 1-in. dowel and that can be recessed flush with the inner face of the bracket ends. (When assembling, leave at least one of these ends unglued, in case you must disassemble at a later date.) I cut my recesses on the lathe, relieving the center so the inner race would turn freely. The roller itself was glued up of scrap hardwood discs cut on the adjustable jig and centerbored for the 1-in. dowel. I applied glue to all joint surfaces and slipped the discs on the dowel, alternating the grain direction, and allowing a 1½-in. projection at each end. I clamped this assembly until set, then centered it carefully in the lathe and turned and sanded it to a smooth finish. I turned the dowel projections to fit the bearings snugly, trimmed them to the right length and made two cuts at right angles in each end, to the depth of the bearing. After assembly, I drove a No. 6 R.H. screw through a ¼-in. hole in each end support and into the intersection of the cuts, to insure a tight fit in the bearing race.

The circle-cutting yoke consists of three pieces of hardwood. The top piece is drilled for a Teenut and dadoed for the legs. The pivot is a piece of bolt ground to a point that extends ¾ in. above the surface. Drill a ⅜-in. hole 1½ in. deep in the bottom of each leg to receive a ¼-in. hanger bolt. For ease of assembly, drill the matching holes in the roller support ⅜ in. oversize and turn a couple of wingnuts on the bolts after you pass them through. ★★ ★

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Versamate is a speed reducer made exclusively for the blister-building business of screw driving. The secret is 7-to-1 speed reduction that boosts power seven-fold and slows down the drill speed until it's perfect for sinking any screw—large or small. See your tool dealer for this \$5.95 beauty.

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Mr. Clifford Turkel has a prize-winning idea



Using the curved rim of the can to remove excess paint will quickly ruin your brush. The simple, prize-winning solution to longer-lasting brushes: stretch a heavy rubber band over the can!

Anyone can win in the Schenley Household Hints Contest.

Mr. Clifford Turkel of Newburgh, N.Y. won the first prize of a De Walt Radial Arm Saw in the Schenley Household Hints Contest. Every month Schenley will award five prizes for the best money-saving, time-saving, do-it-yourself ideas. Here are the other prizes and winners in this month's contest:

2nd prize: Ansco Camera Kit—Mr. R. J. Deah, Streator, Illinois.

3rd prize: Melnor Lawn Sprinkler and Reel—Mr. R. A. Kelso, Paulion, New York.

4th and 5th prizes: Power Hand Saws—Mr. H. D. Whittle, Greenwich, Connecticut and Mrs. Beatrice E. Wheeler, Chicago, Illinois.

Send your ideas today to the Schenley "House-Hold-Hints" Contest, Contest Manager, Room 1303A, 10 E. 40th Street, N.Y.C. Entries must be postmarked no later than midnight, June 30, 1966 to be judged in this month's contest. All ideas submitted become the property of Schenley Distillers Co., and all decisions of judges are final. Offer not made to minors or residents of states where illegal.

Schenley tip for home bartenders:
Don't run out of ice at your parties. A good gauge is to have 1 pound of ice cubes on hand per guest.



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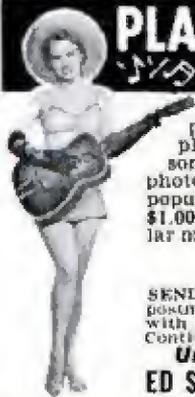
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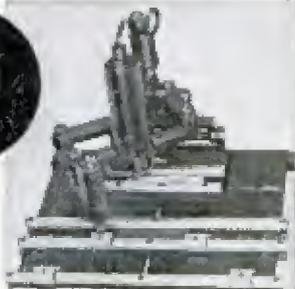
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Dept. N, 639 Passaic Avenue, Nutley, New Jersey 07110

WANDERING FARMS

(Continued from page 97)

dry, which allows even the small amounts of discharged water to soak usefully into the land instead of running off.

In addition to conserving virtually all the water that falls on the land, HILE obviously prevents soil loss. Soil may shift over the surface, but it never leaves the field. In fact, HILE almost always adds soil to fields as rain washing off uncontrolled lands deposits soil behind the dikes.

Shook up by lake

Simple and effective as the system is, seeing it work for the first time can be unnerving. One farmer, who had hired Karch after inspecting installations on other farms, watched with satisfaction as the big yellow earthmovers completed work on his land just hours before the onset of a rain that was to last a full day. When the weather cleared, he went out for a look. "My first thought was that Karch was a dangerous nut who had to be done away with," he recalls. "I had 80 acres under water—as high as four feet near the dikes. I rushed to the phone and told him to get his tail out here and look at the mess he'd made. He said he'd be out first thing in the morning.

"By the time he arrived, I'd cooled down some. I wasn't going to shotgun him on sight anymore, but I was thinking of drowning him in the swamp he'd made of my field. But when we got there, the water was gone, and there were a whole series of ridges where my neighbor's topsoil had dumped on my land."

Karch installed his first structure in 1945, and has since made more than 200 other installations, all in central Illinois. All are still in use, and all have substantially improved the value of the farms on which they were installed.

Despite the success and growing acceptance of his work, Karch still faces what appears to be implacable opposition by the Soil Conservation Service. Karch's patents allow him to license his work to be done by other engineers for a royalty—though no licensed work has been done to date—and the SCS maintained for years that it could not properly comment on the value of a privately held patent.

After a decade of pressure from interested farmers, however, the SCS did send teams around to inspect HILE work in 1964, and report on their findings. The report, which was never made public, is said to draw some scary conclusions about the cost and value of HILE installations, and to make assertions about

maintenance on HILE structures, claiming in substance, that they erode in the rain and are in constant need of repairs. The only maintenance that the structures have ever required, according to Karch, is an occasional clearing of the discharge pipes with a long stick when small animals nest in them.

Opposition from the SCS is as serious as it is inexplicable, since this agency virtually controls farm conservation through subsidies it pays farmers for following approved practices. No subsidy money has ever been paid for Karch work. However, there is such a growing and outspoken group of satisfied Karch customers that the interest of several Midwestern water engineers has been attracted. All have agreed substantially with the opinion of Tom Blair, former chief engineer of the Santa Fe Railway, who studied Karch's work a decade ago as a possible means of reducing the railroad's extensive bridgebuilding needs.

"There is absolutely no doubt that Karch is doing everything he claims," says Blair. "Anybody who says HILE doesn't work doesn't know engineering."

Dry but happy town

A significant HILE side effect shows what it might accomplish in still another area. A paved farm-to-market road near Harristown, Ill., used to wash out after every rain along a low point that drains 500 acres of watershed—less than two square miles. In the late 1940s, the state took matters in hand and put in a small highway bridge—actually a 9½ by 5-foot concrete box culvert with related structures. That helped. The road now washed out only after heavy rains. Then, in 1952, the farmer who owned the land bordering the road engaged Karch to give his field the HILE treatment. The huge, \$10,000 culvert has been dry and overgrown ever since. The Karch pipe that has drained all the water running off the land for 13 years has an 8-inch diameter. No one remembers the last time it discharged a noticeable amount of water.

Speaking from dozens of similar experiences, Karch claims: "If HILE were installed wherever it could and should be—which is wherever land slopes, the entire uplands—it would reduce the flow of water under inland bridges by as much as 90 percent. The savings on bridge costs alone would more than pay for the work. The increase in productivity and value of the land treated would be astronomical."

Broad as the statement is, it is difficult to argue with it on a rainy day, standing in a dry culvert that used to funnel torrents of muddy water to the sea. ★★★



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HERE COMES MR. PARADE

(Continued from page 87)

a parade and buy a float right on the spot for one of the big carnival parades in Cuba or some other country."

By then Vaughn also was supplying materials to the Kentucky Derby and Indianapolis 500 parades. Foreign countries were seeking his floats, his advice or his materials.

"Guam became a steady customer. We still aren't too sure what they do there, but they apparently love parades. We also sell to New Zealand, Liberia and about a dozen other countries. Venezuela is a good customer.

"Once a four-engined bomber from a Caribbean country landed at the Minneapolis airport and a lot of men came over waving cash. They bought a whole planeload of parade materials. We still don't know what they did with them.

"Another time, before Castro—and even before Batista—we sold \$25,000 worth of materials to people in power in Cuba. Later I saw a notice in the Havana paper that the materials had cost \$200,000. Somebody was making a lot more money from my parade material than I was."

It was during those days that Vaughn became one of the biggest automobile owners in the country.

Large old cars best floats

"I bought Packards, Pierce Arrows and Cadillacs by the dozens. They were old ones, usually 1928 to 1932 models. They had especially big frames and big running boards. We cut the bodies off and built mammoth floats around them, using the running boards for supports. I owned perhaps 100 cars. If I only had them now. Today, people pay a couple of thousand dollars each for such cars. I paid \$35 to \$50.

"Now there are special tractors for parade floats, and some people build special frames around modern cars. But modern cars tend to heat up at slow parade speeds, especially if the radiators are covered over with decorations."

Eventually Vaughn began drifting into the production of materials for parades. Such materials—plus consultation with city officials who need advice on how to put on a parade—are his mainstay today, although he also produces Christmas decorations.

About three quarters of the second floor of his factory could be called the "animal farm," although its official title is the papier-maché department. There, craftsman and laborers produce gargan-

tuan roosters, bulls, heifers, pigs, buffalo, horses, camels and eagles. You can also spot globes, ears of corn, maps, huge hats, snowmen and airplanes, all designed for floats.

The main floor of the factory is a tinkerer's paradise. One machine slices through a huge stack of tissue sheets so thin each is almost transparent—the cut must be so clean that it doesn't crinkle the delicate paper. Each tissue cutout then is glued to a cloth backing and moves through a drying oven. The end result is the backbone of the parade-float business—floral sheeting. Vaughn ships big rolls of it all over the world.

Another Vaughn machine is fed long rolls of colored cellophane. Dies come down under pressure and produce dozens of cuts. The result is a spine of cellophane that has tiny, flexible strips that come alive in the breeze when they are stapled to a float.

From crowns to camels

Hanging from the ceiling of the factory are an Alaskan dog sled and six huskies—papier-maché, of course. Thousands of flags are stored in racks. Workers paint simulated rockets, daub colorful spots of blue on an Uncle Sam, and package the end results for towns in the farthest reaches of the world.

The Vaughn parade productions are shipped to about 500 professional builders of parade floats and thousands of amateurs. In the company's catalog are listed such diverse items as "jeweled" crowns for queens, polyethylene daffodils, flameproofing compounds, five-foot-high ice cream cones, six-foot-high cacti and seven-foot-high camels.

"Mr. Parade" has traveled about a million business miles—the equivalent of 400 times around the world—much of it by truck and trailer. Now he is beginning to change his way of living. "I read philosophy and history a lot today," he says.

But even in his glimpses back through history he can't get away from his first love. "They had the equivalent of an Orange Bowl parade back in Babylon," he points out. "It must have been a challenge to decorate a float those days!" ★ ★ ★

Deep-diving buoy

A new Navy buoy dives to pre-programmed depths as low as 20,000 feet, takes readings on undersea noise, temperature and other conditions, records them and then rises and radios its location so it can be recovered. Only moving parts are a tape recorder and fluid valves. The Navy will use it in underwater research.

Want a light ski engine for the kids plus a tough fishing motor with a 2-year warranty for yourself? Solution: the new Sea-Horse 20

Pizazz it has! This biggest of the Sea-Horse Compacts now packs 10% more horsepower. Hold your hat when you hit it because acceleration is up.

This has to be one of the best buys in the line. Combines real power with real portability. Weighs just 17 lbs. more than the Sea-Horse 9½! For the kids' ski needs, with a proper boat and a special accessory prop, it's plenty big without being too big. And for

fishing, it's fast enough to open new, farther off grounds. If you've been eyeing a pontoon boat, here again it's ideal.

Like all '66 Sea-Horse engines, the new 20 thrives on a 50 to 1 regular grade gas-oil mix. This not only lengthens plug life 50%, it saves you enough on oil in one year to pay for your oil the next. Among the 20's other virtues

are hospital quiet, thermostatic cooling, full gear shift and a fuel pump so efficient it eliminates vapor lock. There are

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ELECTRIC GARDEN TOOLS

(Continued from page 129)

metal retainer found on the bottom of the handle. Then remove the handle from the tool so that the wires are exposed. You'll see four wires—two from power line to switch, and two from switch to motor.

In older model tools, the wires are removed by loosening or removing the screws that hold them. The more modern units use spring-type retainers as wire connectors. These will release the wires when a nail or awl is used to probe the vacant slot adjacent to each wire where it leads into the switch.

When installing a new wire—these wires are color-coded—connect the new leads to the same terminals to which were attached the color-coded counterparts they replace. To secure each lead, simply push it into its retainer clip with a nail.

Bearings wear out too

Occasionally you'll rev up one of these garden tools and it'll sound like a shook-up cocktail shaker—amplified. This is its subtle way of announcing a bum bearing. You can verify this trouble by jiggling the armature in the bearing. If "jiggle-able"—that's it. Most of these tools have

press-fitted bearings, so to replace a bearing the entire cover must be replaced.

The cutting blades of many types of power garden tools are self-sharpening and self-cleaning, thus eliminating this particular servicing chore. Double-edged hedge-trimmer blades are an example of the self-sharpening type. When these blades seem to lose their cutting efficiency, you simply tighten down on their tension screws to get them shearing again. The natural rubbing action of the blades keeps them sharp.

However, some types of blades do require sharpening—the *movable* blade of a single-edged hedge trimmer, for instance.

Remove this blade and brush it clean. To sharpen it, clamp the blade horizontally in a vise, teeth up. Using a file held flush against the beveled cutting edge of the teeth, give each tooth one long, steady stroke while moving the file toward the pointed end of the tooth. One pass with the file is usually sufficient, though two passes may be required for badly dulled blades.

Rotary blades are usually found on edgers. If these are gouged or heavily nicked they should be replaced. Otherwise, they can be sharpened on a grinding wheel. ★★★

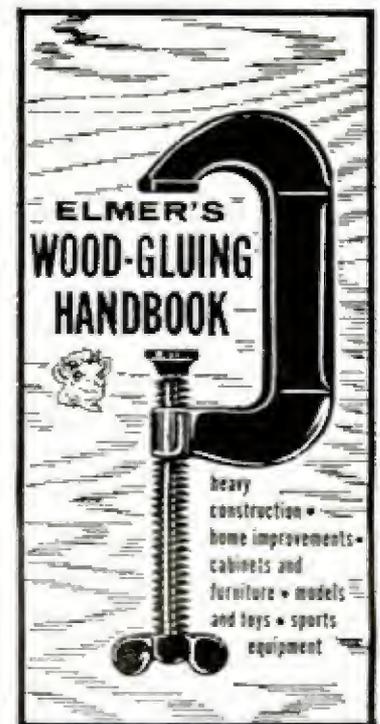
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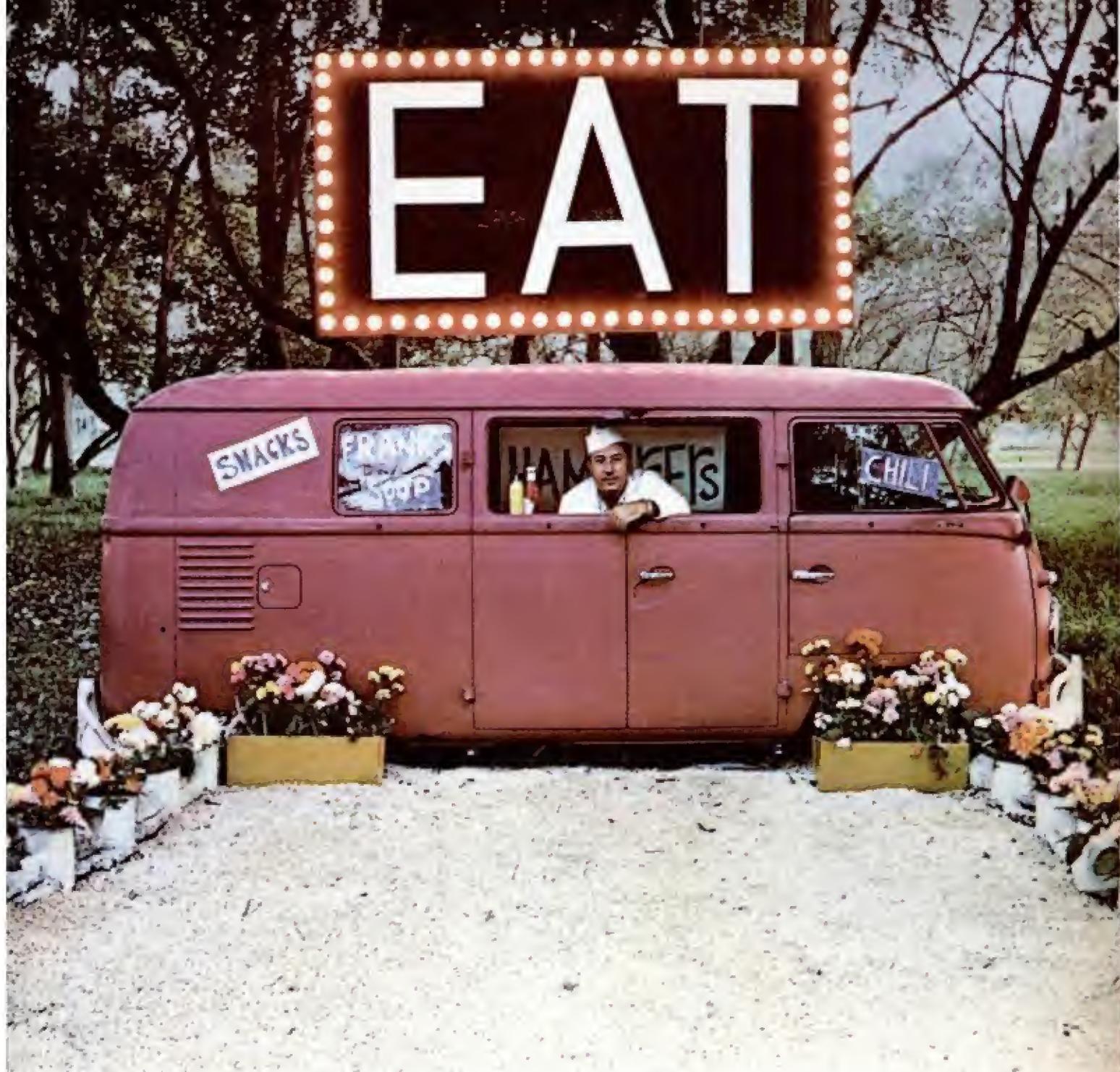
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LUXURY LIMOUSINE

(Continued from page 118)

jazzed-up lids; running boards; bullet-proof bodies (about which no one likes to talk except to say they exist); installation of photochrome glass that looks clear but grows darker as the sun grows brighter, and removable tops for cars to be used in parades and the like. Interiors have ranged from the Papal car with its hydraulic throne to a number known around the shop as "The Funeral Special." Sold to an undertaker, it is painted a dignified black but upholstered in ear-shattering scarlet.

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Biggest surprise is growth

The biggest surprise the young company has had to date is the rate at which it has grown. Having converted just two 1963 models—both for testing—they produced 15 1964s and 85 1965s. They expect to convert about 200 of the 1966 model. Their plant has grown from a two-car garage on Chicago's West Side to three substantial buildings. Staff has increased from four to 45. Panels, floor pans and other parts for the stretched car, once handmade, are now ordered from suppliers and inventoried.

From every indication, the growth will continue, too.

"You could reasonably say that people are standing in line for the car," says Lehmann. "Our backlog of orders varies at different seasons, but the trend is unmistakable. We're just not stretching cars fast enough." ★★★

This unsteady earth

Slight wobbles in the earth's motion as it revolves around the sun caused the climate changes, known as Ice Ages, which now have been quite accurately charted for the last 200,000 years. Reporting on his new theory, Dr. Wallace S. Broecker of Columbia University's Lamont Geological Observatory, asserts that it also explains the high level of glaciation that occurred some 19,000 years ago.

Dr. Broecker's theory assumes that the interaction of temperature levels between the atmosphere and the ocean has only two stable states—glacial or interglacial. Rapid transitions between these states are triggered when solar radiation levels are at their highest. However, fluctuations about either of these two stable states occur in response to smaller changes in radiation not large enough to cause the rapid transitions.



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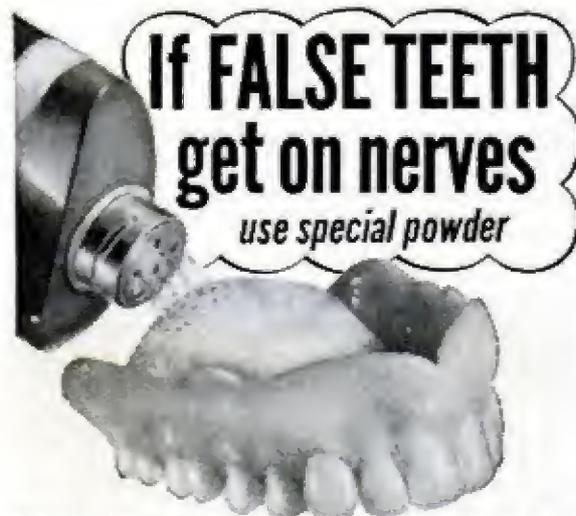
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TIGER IN YOUR TOOLSHED

(Continued from page 103)

and his head was 7 feet above the ground! A 5-year-old girl was hit on the back of her heel by an 8-inch piece of heavy wire while standing 3½ feet to the right and 5 feet behind a mower. The mower had a plastic guard on the discharge chute, but it was too light to stop a heavy object.

"Malfunctions" were those injuries where failure of the machine to operate properly caused the operator to take an unsafe action to correct the trouble. A badly designed mower often invites carelessness by an exasperated operator. If it keeps getting clogged up or if the wheels keep coming out of adjustment, the operator is tempted to do risky things. Of 10 victims of this type of accident, five suffered injuries to their hands and five to their feet. Two underwent amputations. Riding mowers accounted for half of the accidents in this category.

"This indicates the need for safer design in riding mowers, especially," says Prof. Knapp. "On a riding mower you have the problem of steering—like you have with a car. If you mow on a hillside you have the stability problem. You can back it up like a car, so you have to remember to look behind you. We know of accidents where people have backed over kids."

Carelessness big factor

Most of those who lost a finger or a piece of foot were careless, or absent-minded. They brought on their injuries—the most severe, but not the most numerous in any of the groups—by their own "Unsafe Acts."

One of these hapless victims even had a little help from his wife. She moved an empty bottle-gas cylinder while he was mowing and he backed into it—pulling the mower backwards was his contribution. He went head over heels, with his right foot under the mower. The blade cut clear through an engineers' boot plus five of the man's toes.

In the last group, "Non-Operational Injuries," five out of seven victims were injured while tightening or loosening the blade, an indication, says the university, that a safer method of attachment or removal is needed.

Because more than half of the injuries

were caused by flying objects, Prof. Knapp and his associates believe the industry's first responsibility is to design a mower that won't throw things. That's why they dreamed up the "pinball machine." They wanted to find out what really happens when a strip of hard steel spinning at 2500 rpm connects with a rock or piece of metal. What happens inside the metal housing before the rock or piece of metal comes hurtling out as a deadly missile? . . . when you raise or lower the housing? . . . speed up or slow down the blade?

To show that it took the problem seriously, too, the Outdoor Power Equipment Institute gave them a research grant.

No one knows for sure how many persons are injured by power mowers; 80,000 per year is a good guess. That's a lot of toes and fingers. The hazard isn't going to disappear by itself.

25 million mowers

The industry expects to sell 4½ million new mowers this year—1 million of them to first-time owners. By the end of the year, there'll be 25 million, a million more than in 1965. The prospect sobered even the men who make them.

They were also sobered fast when Sen. Warren G. Magnuson, of Washington, jumped on them in a Senate speech a year ago. They remembered the hell that broke loose on automobile safety after a couple of Senators blasted Detroit.

OPEI's members didn't wait for other critics to jump on their backs. They called a government-industry seminar on power mower safety in Washington last winter and invited safety experts to participate.

One of those who did was Dr. Aaron W. Christensen, deputy surgeon-general of the U. S. He laid it on the line: "Entirely too many people are getting hurt by rotary mowers. This is a problem of sufficient magnitude to be of concern to the Public Health Service."

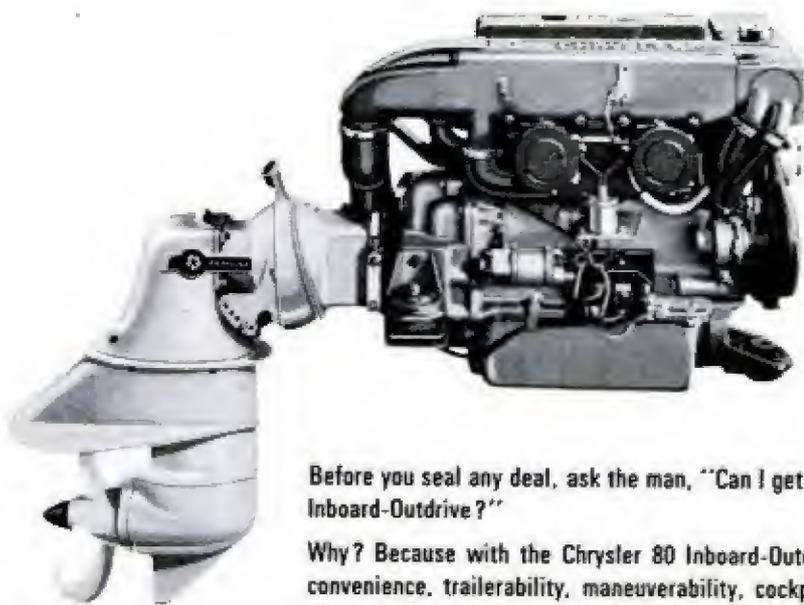
Mando S. Ariens, president of OPEI, speaking for the mower makers agreed: "We admit we have an inherently dangerous product."

But, he added, the manufacturers are doing something about it. He then announced OPEI's "Safety Seal" to be displayed on mowers meeting specifications set up by the American Standards Assn. About 90 percent of the mowers sold in

(Please turn to page 190)

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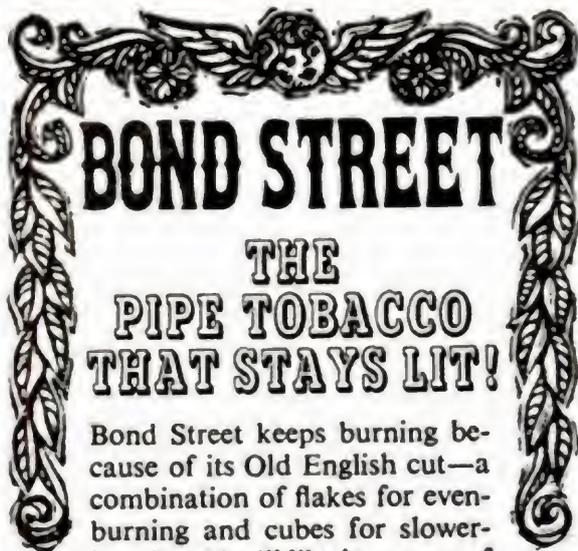
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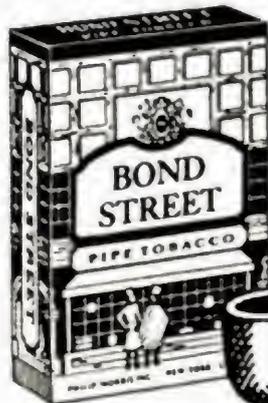
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TIGER IN YOUR TOOLSHED

(Continued from page 188)

1966 are expected to carry the seal.

To earn the seal a mower must be made of sturdy materials and have a smaller discharge opening with a lower angle of discharge, a guard to keep feet away from the blade, a positive stop on the handle to prevent "swing-over," all moving parts enclosed, a blade-tip speed not over 21,000 feet per minute and a housing that extends at least 1/8 inch below the blade.

In addition, riding mowers must have enough stability not to upset when tilted 20° forward, 30° to the rear or 40° to the front, and must have wheel brakes or enough motor drag to stop the machine.

A blade-tip speed of 21,000 f.p.m. is still pretty fast. The trouble is, no one



SAFETY SEAL for mowers that meet ASA standards

really knows how slow you can run a blade and still cut grass. One thing the Iowa tests did show was that the faster you run the blade, the farther things will fly. When the blade on the pinball machine ran at only 1500 rpm, objects were thrown to a mean height of 8.5 inches. But when Prof. Knapp speeded it up to 2500 rpm, they soared to 13.2 inches! The obvious lesson: Run your blade as slowly as you can and still cut grass.

One thing the Iowa researchers won't buy is the old alibi that "all accidents are due to the carelessness of the operator." And even when you do get forgetful, it shouldn't cost you a toe. Nor do they think it's enough to tell a buyer to check and be sure the wheels are big enough and the wheel adjustments reliable. The OPEI seal will eliminate some of the guesswork.

But Prof. Knapp thinks the industry must come up with still safer machines.

He wants to see a mower that won't throw objects, either from the discharge chute or out the rear.

He wants to see cutting heights adjusted by a single lever that raises or lowers all four wheels. "Then we'll eliminate the

(Please turn to page 192)



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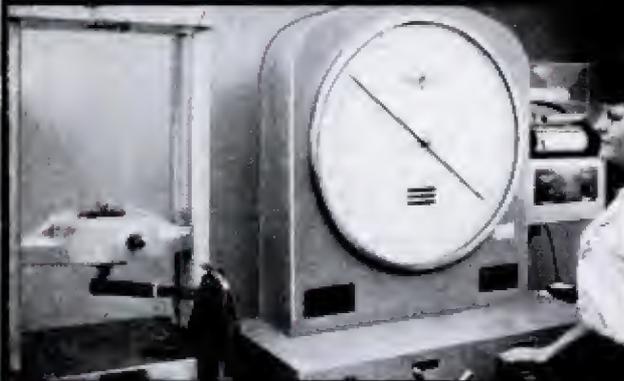
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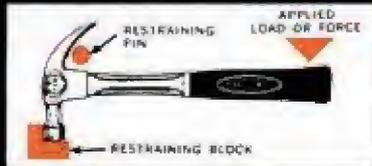
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Diagram of test shows how
load is applied same as
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Ocean floor may have sunk

Parts of the Eastern Indian Ocean floor may have sunk as much as a mile since the bottom rocks were formed some 30 million years ago. By dredging the flank of a large submerged volcano southwest of Sumatra up 12,000 feet, scientists recovered basalt with tiny, almost spherical cavities. Usually, basalt extracted from this depth does not have cavities.

Although some changes in depth would be due to the addition of ocean water, scientists believe that geological processes forming the undersea Indonesian Trench have caused the entire bordering sea floor to be depressed.

Milkshake in lieu of T-bone

Incaparina tastes good like a milkshake should. No ordinary milkshake, though,

this specially developed drink contains as much protein as a good-sized chunk of meat.

Developed at the Institute of Nutrition of Central America and Panama, Incaparina is a vegetable concentrate derived from a variety of grains and seeds, which is added to soups, puddings and cookies as well as the popular milkshake.

Known as avena, atole or colada (depending on the country), the drink is a favorite at soda fountains in Central America and Panama.

Since its introduction six years ago, this nutritional milkshake has also attained enormous popularity among school children, to whom it is given every morning in a government-sponsored program to make up for the meat they lack. The drink is described as the flavor and thickness of a thin vanilla milkshake.

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TIGER IN YOUR TOOLSHED

(Continued from page 190)

accidents where guys get disgusted and kick at the individual wheel levers and stick their foot under the mower."

He wants to see a standardization of controls, with all of them on the handle. Riding mowers should be made harder to start. Self-propelled mowers should be made easier to stop. Electric mowers, which tend to "windmill," should have some device to stop the blade right now. All mowers should have some sort of "deadman control."

"Some of these features are available now on a few mowers," he says. "Others await further research and development. No one really knows, for example:

"The amount of horsepower needed to cut grass. The industry is trying to come up with an engine which will run slower, but this isn't easy. We can talk about 1800 rpm, which might be enough to cut grass, but getting an engine to run that slow and still have power is something else. Right now the manufacturers have two choices: Put in a big engine and run it slow, or put in a little engine and run it fast.

"No one knows the minimum tip speed which will cut grass cleanly. No one knows the maximum diameter of a blade to minimize the throwing of objects. No one knows the effect the amount of suction designed into rotary mower blades has upon the tendency to throw objects. No one knows the least hazardous location for the discharge chute. No one knows the housing design that would keep objects from flying out the rear. No one knows the minimum safe height for mowing grass."

Safety sparks competition

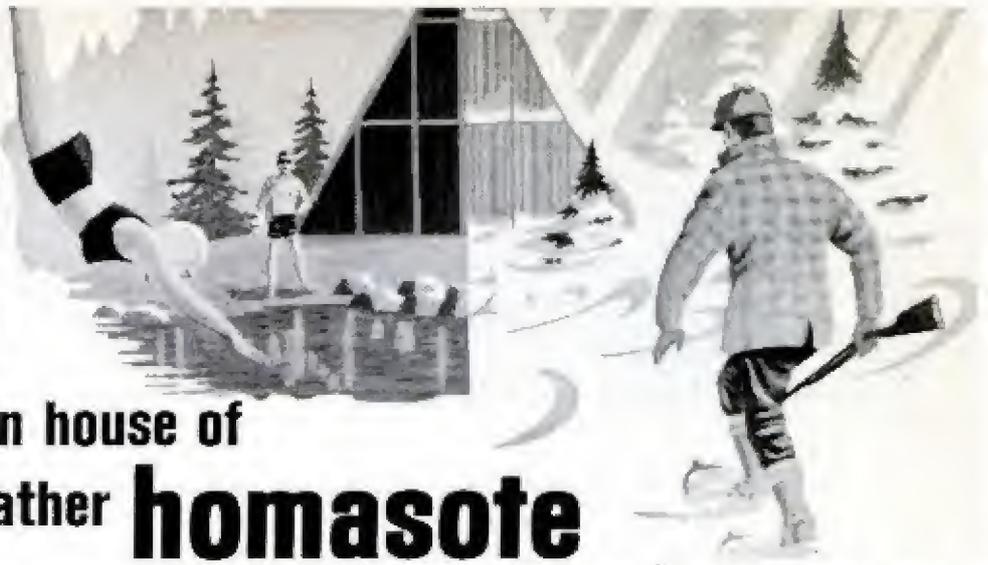
As fast as these things are learned, manufacturers can be expected to apply the answers to their mowers—at least to top-of-the-line models. Already some makers offer lighter-weight housings of cast aluminum and magnesium. Some do have single-lever wheel-adjusting and bigger, easier-to-push wheels that roll more easily over bumps and depressions, and spark arresters on mufflers to prevent accidental ignition of gasoline.

In what President Ariens describes as "a competition to put the safest mower on the market," at least two makers have a washout port" in the deck, through which

(Please turn to page 194)

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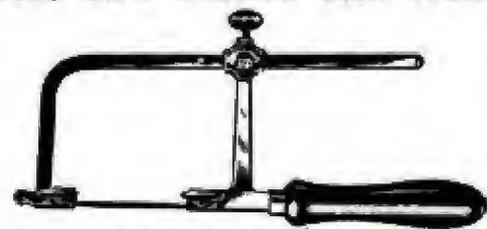
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TIGER IN YOUR TOOLSHED

(Continued from page 192)

you can squirt a hose while the blade is running. Some have put the discharge chute in front. Others have deflecting rods in the chute and several do have deadman switches, requiring pressure or a slight twist on the handle. One rider cuts off power to blades and wheels whenever you leave the seat. Several have new blade designs. One is S-shaped and is supposed to hit objects with only a glancing blow. Another has four small blades on a disc; all retract when you hit a hard object. One mower has two blades: one for cutting, one for cleaning. Several heavy-duty riding mowers have hydraulic lifts to raise or lower the rotor.

Prof. Knapp thinks this is to the good. Smaller blades are generally less hazardous than big ones. Still, with more than one blade, he thinks you have a greater chance of something coming loose.

Grass-catcher problem

Another gadget that's getting a big play this year is the good, old grass-catcher, without which no hand-powered reel mower was complete. They're showing up on rotaries, touted as safety devices.

Prof. Knapp has mixed emotions. "A big grass-catcher attached to the chute can impair the stability of the mower. When the bag's full of grass, the grass may stop a thrown object like they say. But we bought a grass-catcher for my boy, who does custom mowing. The first day he got three big slits where things went right through the bag."

Safety costs money, on mowers as well as on automobiles.

"A lot of people," notes Prof. Knapp, "will pay \$49.50 for a mower, but not many are willing to pay \$100 to get extra shielding, all the controls on the handle, and an engine big enough to provide maneuverability. On a cheap mower the maker has to leave off the 'frills' which give you real control over the machine. But if it meets the ASA standards as to housing and chute design, blade recessing, tip speed and handle stops, it can get the Safety Seal, and that's progress.

"The one thing to remember is that whether a mower has 2 hp or 10, costs \$40 or \$400, it still has one potentially dangerous element—a rotary blade." ★★★

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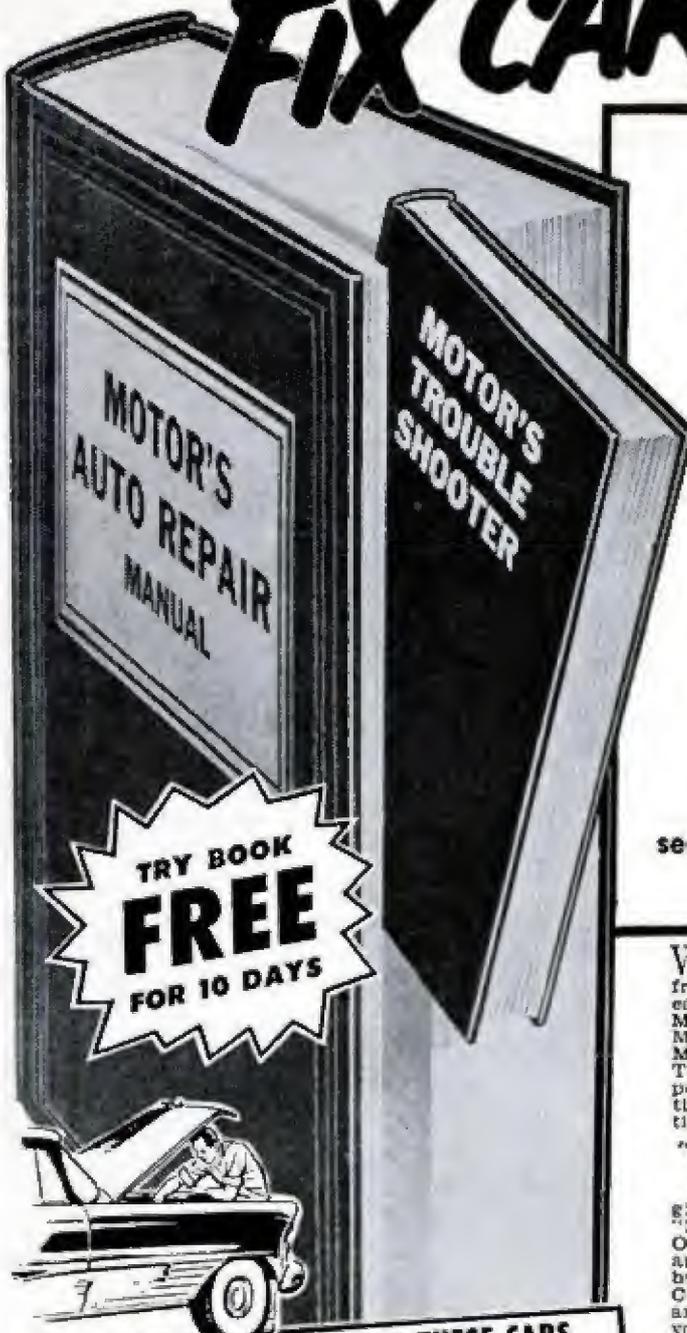
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CORONET OWNERS' REPORT

(Continued from page 76)

entitled to road-test the car they buy before taking it home.

Part and parcel of the same overall complaint are rattles:

"There's an annoying rattle in the horn ring and from the spare tire cover."—Washington engineer.

"Rattles have been present since the first day I got the car."—New York salesman.

"The rattle in the horn ring gets on my nerves. No one can seem to fix it."—California technician.

Lack of economy ranked fourth on the complaint list. One man said he got only 8 mpg around town, 11 mpg on the open road. He's the extreme, granted, but a lot of people expressed something other than fascination with the mileage they are getting. Their comments are as subtle as baseball bats:

"Don't get enough mileage."—Texas cattleman.

"I'm disappointed by the mileage I get on this car. I realize I didn't buy an economy car, but still it ought to do better than 10 miles to a gallon."—Colorado miner.

► Yep. It should.

Apparently a few Coronets are oil burners—either that or there's a leak somewhere. Some sample comments:

"Car uses a quart of oil every 100 miles."—Oregon engineer.

"In the first 3500 miles, I added seven quarts of oil."—Ohio technician.

These complaints about Coronet oil and gas economy were, however, outvoted by owners who felt their cars were money-saving little jewels. For example, an Ohio farmer—obviously a frustrated ad man—wrote:

"It's a thrifty beauty at a low-low price."

"I get fine mileage. Car runs like a top."—Oklahoma salesman.

"Sure is easy on gas and oil."—Michigan factory worker.

"I get good economy and still get all the power I need."—Alabama truck driver.

The Coronet also drew owner applause for comfort. Replies to PM's survey cited such items as seat construction and position, general interior roominess and overall design:

"The best seat support I've ever seen or felt."—Iowa manager.

"The seats are very comfortable all 'round."—New York secretary.

"It's more restful than other cars I've driven."—New York retired.

"Although not a big car, it's roomier

than others in the same class."—New York biochemist.

► Not necessarily. However, he's happy.

"The interior of my Coronet is very well finished."—Kentucky purchasing agent.

"The interior is beautiful."—Wisconsin foreman.

Rounding-out Coronet owners kudos were many mentions of good visibility:

"Car offers excellent driver vision."—California policeman.

"You can see where you're going."—Texas manager.

"Dashboard above steering wheel is made low and does not block view."—North Carolina laborer.

While the view may be nifty, quite a few owners felt that cramped headroom reduced the joys of rubbernecking.

"The front roof slant cramps headroom."—Florida postman.

"I keep bumping my head on the roof."—Texas dentist.

► It feels so good when you stop—right?

"I hit my hat every time I enter or get out of the car."—Minnesota superintendent.

Another owner complaint was the dash ashtray.

"The ashtray is right below the ignition. They should have put one either on the right side below the glove box or in the middle."—California salesman.

"It needs another ashtray on the passenger side and also an ashtray light."—USAF, Delaware.

"You can't find the ashtray in the dark."—Michigan barber.

Ranked seventh on the gripe list were brakes, most complaints being that they were noisy. A Nebraska engineer said simply:

"They squeal."

"I get vibration and noise when applying brakes at high speed."—Florida factory supervisor.

"My brakes grab and squeal when wet."—Iowa farmer.

A few Coronet owners said they thought handling could be improved.

"Roadability isn't what it should be. Car seems a little light at 60 mph or better."—Montana salesman.

"I'd like it to take curves and corners a little better."—Georgia merchant.

"It's hard to control on snow or ice and doesn't get much traction."—Colorado technician.

Winding up Coronet complaints, several owners turned thumbs down on what they felt was inadequate insulation against road noise. Their comments along this line were summed up bluntly by a Texas plant supervisor: "Road noise is terrible, just terrible." ★★★

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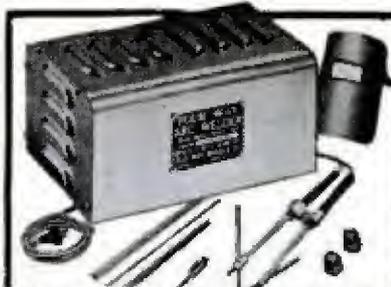
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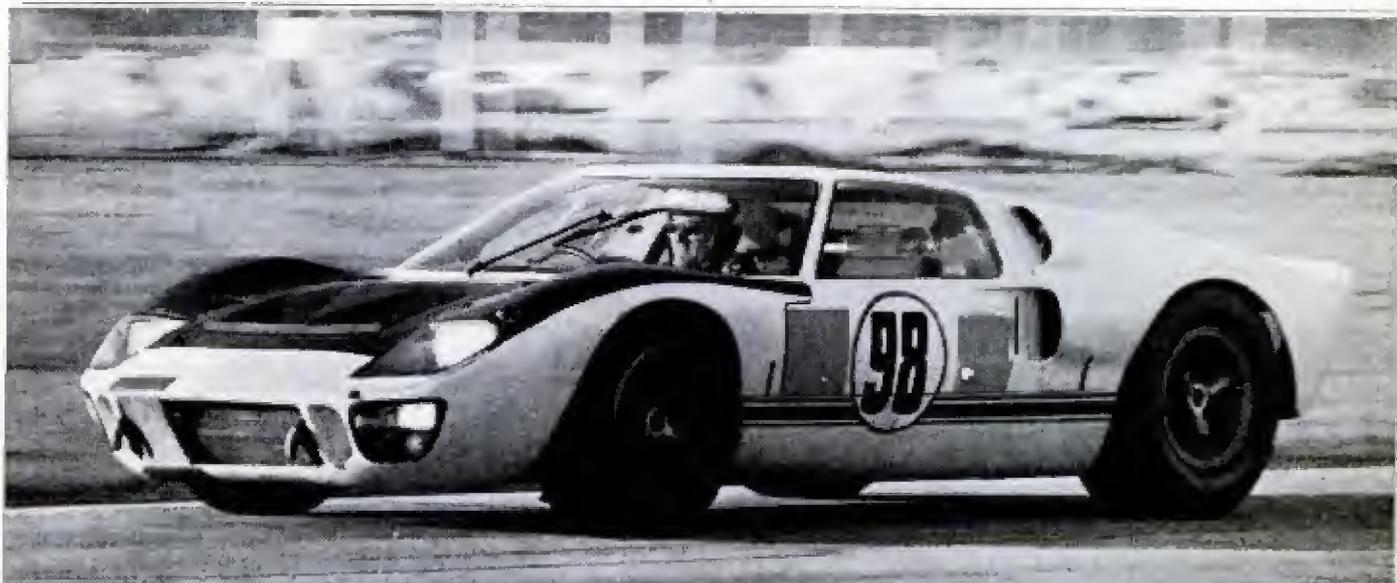
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ceramic surfaces



Sharpen mower blades, tools,
knives, clippers

SNAPSHOTS OF THE '67 CARS

(Continued from page 65)

than the present stodgy, boxy-lined Imperial.

Safer cars. You can't talk cars nowadays without mentioning safety. State and federal laws, government vehicle specifications, insurance rates, lawsuits, charges of neglect—these and more have made Detroit supersensitive to the safety problem. Though the industry has brought out new safety developments annually, the next two years will see more progress in making cars safer than the preceding 20.

Dual-cylinder brake systems will be standard on 1967s. Available on Cadillacs and American Motors cars for some time, they are designed to prevent full loss of braking power if a hydraulic brake line is ruptured. Brakes will improve too. For the first time, more than half of the new cars will offer discs. Mostly, they'll be optional for installation on front wheels only.

Collapsible steering columns for the '67s have been announced by GM and American Motors and Chrysler is expected to follow. Ford is sticking with a modified version of the deep-dish steering wheel it introduced back in 1956. Both column and wheel are designed to prevent chest injuries in sudden stops or head-on collisions, and both meet government specifications for doing the job. Also, to reduce "second collision" injuries inside the car, dashboards will get thicker padding and the shelf they form in the front of the car



THUNDERBIRD for '67 will introduce a 4-door sedan, but hold off on convertible till later in year



MERCURY'S COUGAR will debut as 2-door hardtop with fastback added as '67 "half-year" model

will shrink in size as the safer, swept-back dashboards are brought into production.

Most significant safety changes this coming year result from Congressional pressure. The best example is the list of 17 safety items required by the General Services Administration on all cars purchased by the federal government after next Sept. 30. We'll have to wait until the 1968 model year before some really basic safety changes are made available in quantity, such as wraparound seats, collapsible frame, heavily padded interiors and safety instrument panels.

Substitute materials like aluminum in radiators (Lincoln) and plastic in outside trim (Pontiac) will become more common on '67s. Also, look for more use of airconditioning, stereo tape systems, automatic door locks and, perhaps later in the year, wrist-twist-type steering controls.

Spare tires—there's a real possibility of their elimination. One auto supplier has developed a second wheel to fit around the wheel inside a standard tire. In case of a flat, the second wheel will protect the rubber of the regular tire and permit you to drive miles to a service station for repairs. It's also a safety item since it eliminates the sudden lurch that accompanies a blowout at high speeds.

Here is a summary of what to look for in the rest of the '67s:

American Motors. Ambassador and Classic will get completely new sheet metal and two-inch-longer wheelbases. Overall length will stretch four inches. Styling will depart from the present hard, angular lines to follow the rounded, sloping look of the big Chevrolets.

The company is going all-out to challenge the big Fords, Chevys and Plymouths with big cars that offer luxury, not economy. To most observers this is like the Vietcong building tanks to challenge the 1st Marine Division—sheer folly leading to disaster. However, AM's new 290-cu-in. V8 may replace the current 287-cu.-in. V8 on Classics and Ambassadors.

Wraparound taillights will be easy to see from the side on AM's '67s, a feature the company will "sell" as a safety extra.

Don't look for a small car like the AMX this year or even next spring. It's hardly possible to bring one out before 1968 model time.

Ford: Mustang, the car that spawned a whole new class of American motoring, is newly styled for 1967. But the changes are subtle. It will lose its crisp look, switching to a squat, burly appearance, but there will be no mistaking it's a Mustang. In pictures, the car appears nearly identical

to present models. A startling two-door fastback with aerodynamic lip on the rear end will star in Mustang's 1967 lineup.

The big Fords and Mercurys will have all-new sheet metal to make the cars appear rounder, but the general look will be virtually unchanged. One exception: a new two-door hardtop that comes close to being a full fastback. Ford and Mercury will have a similar roofline except that from the top of the back window to the end of the roof the roof outline will be slightly concave—a stretched-out version of present two-door hardtop roofs. Mercury will call this model the Marquis, and also offer a top-of-the-line four-door to be called Brougham. Mercury taillights will be banana-shaped and upright, following the outline of the rear fenders. Up front, '67 Mercs look a lot like Lincolns with a severely overhanging hood taking up almost half of the grille area.

Lincoln will have minor styling refinements, but won't change to separate frame and body construction until 1968.

Comet, Fairlane and Falcon are in line for minor appearance and mechanical refinements. As an example, Falcon will have this year's grille split by two aluminum bars—one vertical, one horizontal—which cross in the middle of the grille opening. The front fender will get stamped-in wind tears placed just behind the front wheel opening.

Chrysler: By the time this is printed, some announcement will have been made on the turbine program. Speculation now looks for announcement of a new turbine "under development," with further study to be made before a turbine car can be produced. Chrysler will continue to milk publicity out of the Ghia-built turbine test cars by taking them on a cross-country tour of such places as college campuses to "test the reaction of young people."

Valiant and Dart will get the most attention of the company's production cars. Both will have completely new bodies, but don't expect anything spectacular. Chrysler has swung from one styling extreme to another. Now their cars are conservatively styled. Once a leader, the company now seems content to follow style trends set by others.

Sheet-metal changes will be extensive on Furies and the big Dodges with a lot of metal sculpturing on the sides and a brand new roofline for the two-door hardtops—to match the Chevys and Fords. Front and rear fenders on Fury are pointed, making the car look longer, bigger. Coronet and Belvedere facelifts will be minor since they were all new this year. Big Chryslers will sport new sheet-metal changes

(Please turn to page 202)

BIG JOB SCRAPER



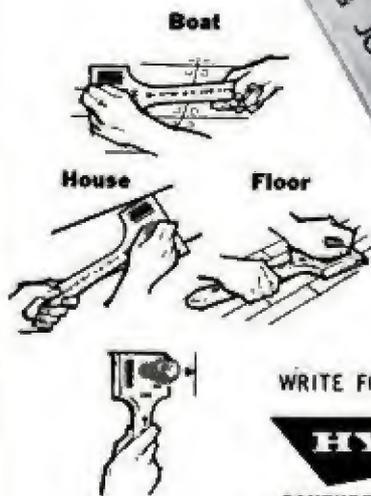
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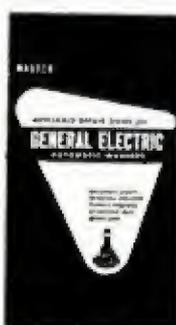
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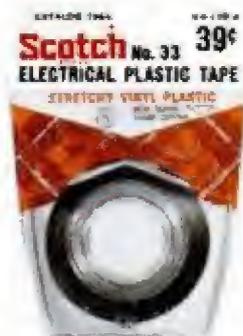
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SNAPSHOTS OF THE '67 CARS

(Continued from page 201)

and share the unique two-door hardtop roof with the big Dodges and Plymouths. This roof, shaped like the top of a "Z", has the rear window glass flowing gradually into the deck. Look for a more generous use of clear plastic shields ahead of the headlights on Imperials and Chryslers.

General Motors: Cadillac will have flow-through ventilation on standard models next year, as will all the big Oldsmobiles and Buicks. Also new on Caddy will be the sheet metal below the beltline, grille and rear-end styling, but it will still appear like the '66s.

Pontiac, Olds, Buick and the big Chevrolets are to share the same basic body shells for the most part, and will have the graceful two-door fastback shown in the Chevrolet and Pontiac pictures on these pages. Front fenders on the four-door sedans will be stretched and given a rounder appearance. Buick's grille, most conventional of the four, will offer little change.

Pontiac is introducing two different grilles for Catalina and Grand Prix. A novel arrangement for the Grand Prix has hideaway headlights mounted horizontally and turn signals tucked up under the peak of the front fenders. Olds' new grille is nearly split in two by a hood section which oozes over the top center, something like Barracuda's. Toronado and Riviera plan slight changes in grille and rear-deck appearance. Toronado will eliminate the "eyebrows" over the front lights.

Chevelle will pull back on its extreme styling of two-door fastbacks. That back window will be aligned with the curve of the rear roof and facelifts are set for the grille and rear end. Corvair and Corvette plan minor changes, but watch Corvette for something special later in 1967. ★★

Heat curbs cancer growth

Raising body heat briefly to a high level may effectively control the growth of cancer cells, according to an East German physicist. Dr. Manfred von Ardenne reports that tests raising the body temperature of 20 young-adult cancer patients to 110° F. for 30 to 45 minutes killed 95 percent of the malignant cells. The treatment is best used, he says, following surgery to remove the primary tumor.

While critics argue that heat can kill normal cells and that cancer cells may become resistant to periodic heat therapy, Dr. von Ardenne declares in *Medical World News* that anticancer drugs will be more effective after the heat treatment.

BYE-BYE, BACTERIA

(Continued from page 93)

should not believe that by buying those germ-resistant products they need not follow normal personal sanitary practices in protecting the health of their families."

While some critics contend the germ-fighting chemicals can be dangerous, Dr. Stuart denies there are hazards in those approved for general sanitizing. What about people subject to allergies? Today, before a germ-resistant product can be cleared by the Department of Agriculture, the manufacturer must hire a research lab to do skin-sensitizing patch tests against the chemicals.

Meanwhile, more and more anti-germ consumer products are coming out, giving cleanliness-obsessed citizens—especially the American housewife—a "whiter-than-white" sense of security. We still don't have germproofed dollar bills, telephones or playing cards which one doctor called "germ sponges." Nor has it been possible yet to sanitize acrylic materials, which don't absorb anything. On the bandwagon, General Motors is said to be studying ways to sanitize new cars.

The way we live, the perfect germless home doesn't seem possible even in the world of tomorrow. Actually, Dr. Stuart reminds us, many bacteria are beneficial, "even essential to the well-being of man."

Despite Dr. Stuart's skepticism, there must be something to the antiseptic gimmick. Look at what happened to Dartmouth. In 1964, after it had a so-so football season, the coach wrote plaintively in the alumni magazine that about one-third of his 80-man squad had been out of action at one time or another because of staph and other infections. One loyal alumnus, a vice-president at M&T Chemicals, offered to help with something called "Project Touchdown."

Last August, he brought his bio-Met bacteriostat to Dartmouth, had the laundry and mop water-treated, the lockers scrubbed with the chemical. During the '65 football season, a fogging machine sprayed the varsity locker rooms. A control test was conducted with the freshman team, which went without benefit of bio-Met—and got "a disturbing number of infections" as in the past.

How did the varsity team make out? No infections last fall. Incredibly, Dartmouth went on to an undefeated football season, won the Ivy League championship and the Lambert Trophy, recognition as the strongest team in the East!

If you've got to be germ-free to win, maybe we all ought to be sanitized, after all.

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BIG BUSINESS UNDERSEAS

(Continued from page 83)

sis has shifted to a new idea: ocean engineering. The object is big-scale exploitation of ocean resources.

The key to this new branch of engineering is equipment designed to let men work safely and efficiently underwater. The *Cachelot*, made by Westinghouse, is the latest and possibly the most important entry in this field.

The first time I saw the *Cachelot* in action, oddly enough, was a long way from the sea: high up in the Virginia mountains at Smith Power Dam near Roanoke. A huge steel grate had come apart at the bottom of the dam.

From a small wooden shack atop the dam, I watched the operation via closed-circuit television. Except for those special tools and the sleek rubber suits worn by the divers, the action on the TV screen—lit by sealed headlights installed on the scene—looked like ordinary construction work.

"That's just the point," explains George R. Wiswell, the lanky president of Marine Contracting, who supervised the project. "We can now do underwater almost any building job normally done on land. The main thing is—we can stay down long enough to get the job done."

This was not always so. In the past, a diver could not put in much working time at the bottom. "Most of his day he spent just hanging in the water," recalls Wiswell, himself a veteran diver. "He had to be pulled up very slowly. After an hour's work at 250 feet, it took five hours to get back to the surface."

No 'bends' to worry about

Reason for the slow ascent is that the body can't tolerate a rapid pressure drop. If the diver rises too fast, he gets the "bends"—a horribly painful and sometimes fatal condition caused by air bubbles boiling out of the blood as the outside pressure decreases. The deeper you go, the longer it takes for the body to readjust to normal surface conditions. "On a deep dive," says Wiswell, "we were lucky if a guy did 20 minutes' work per day—at the rate of \$2000 per dive."

The *Cachelot*, by contrast, permits instant ascent. No time is wasted in decompression after each trip to the bottom. Instead, divers stay at bottom pressure all the time—even after they get back on deck.

Cachelot divers travel to the bottom in the round steel cabin described earlier. Basically it is a diving bell with a big bottom hatch. Air pressure inside the

chamber is adjusted to match water pressure outside. As a result, no water bursts in. Even when the hatch in the floor is opened, the chamber stays dry and lets the divers breathe without diving suits and masks. Only when they reach bottom do the divers slip on their face masks, latch lines for breathing, communications and telemetering to the belts of their heated diving suits and swim out.

While the men work, the submerged chamber hovers nearby to serve as home base, safety retreat, workshop and toolshed. The divers swim in and out—from dry to wet surroundings—as easily as walking through a door.

"We're never more than a moment from shelter," says Jim Burgess, a husky, curly-haired diver for Marine Contracting; "That's good for morale."

Pressurized home on deck

But the *Cachelot's* real payoff comes at quitting time. No longer does the diver have to be inched up for hours. He just climbs into the submerged chamber, shuts the hatch to seal in the pressure, and it is whisked back on board like an express elevator. Since the pressure inside the chamber stays put, his physical reactions are unaffected by the fast rise.

Back on deck, the submersible chamber is "married"—joined with an airtight connecting passage—to the second part of the *Cachelot*, the deck chamber.

Sleeping bunks, writing tables, bookshelves, a record player and a toilet provide all the comforts of home—except a kitchen. Cooking odors would contaminate the high-pressure atmosphere. So food is passed in from the ship's galley through a pressure lock.

Here the divers—four of them in the current model—sleep and spend their free hours. Thanks to this pressurized deck chamber, divers remain at bottom pressure even in off-duty periods. They "commute" to and from the underwater work site without delay.

Except for weekend "climb-outs" they stay pressurized the entire workweek. And even when they do decompress for time off or when the job is finished, the lengthy process takes place while they relax in the safety and comfort of the deck chamber.

The *Cachelot* and similar devices now under construction are opening up new areas of the ocean floor to commercial ventures. Present equipment is designed to a maximum operating depth of 600 feet, but before long divers expect to go twice as deep. With a diving limit of 1200 feet, man will have direct access to

(Please turn to page 206)

The Fish-Snitcher

The Fish-Snitcher is G.E.'s answer to the WW II walkie-talkie, only 25 years better.

It's lighter, tougher and you can work it easily with one hand.

Instead of wasting a day looking for the big ones hit-and-miss style, you and your buddy take along a

pair of Fish-Snitchers and separate.

When one of you finds where they're biting, the other one gets the good news via Fish-Snitcher.

G.E. makes two kinds of Fish-Snitchers. The Y-7000 with a 56-inch whip antenna and an effective range of 2 miles for \$59.95* a pair.

And the Y-7010 (shown at right) with a 59-inch whip antenna and a range of 3 miles for \$75* a pair.

Bonus: To convert your G.E. Fish-Snitcher into a G.E. Kid-Snitcher, Wife-Snitcher, Husband-Snitcher or Friend-Snitcher, do the following: Take it home.



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I drowned
12 worms.
How are they
biting down
by you?"

"Like it was
going out of style.
Come on over.
Just try not
to sound like
a parade."

BIG BUSINESS UNDERSEAS

(Continued from page 204)

an ocean floor area equal to all of Africa.

Despite these advances in diving equipment, the oceanologists hope that man will be able to exploit the ocean without having to spend too much time in the water. Once sea-bottom facilities are set up, they are expected to run with little or no human help. "Our problem," quips Ron Dozier, "is how to succeed in this business without getting wet."

Dozier, an engineer for the Shell Oil Co., managed to stay dry by helping design equipment that drills and maintains undersea wells and pipelines by remote control from surface ships. With TV cameras for eyes, sonar for ears, and a variety of wrenches, screwdrivers and pliers as "hands" on its long flexible arms, the Shell *Mobot* responds "almost like a man" to electronic commands.

Oilfields 2000 feet down

Up to now, offshore drilling has been confined to shallow coastal areas. But with new diving techniques and undersea automation, oil companies are heading for the open sea. John Loudon, chairman of Royal Dutch Petroleum—the parent

company of Shell Oil—declares boldly that within two decades underwater oilfields will be operating at depths to 2000 feet and that crude oil will be stored in gigantic undersea containers.

Robotlike undersea devices with electronic sensors and tool-tipped arms are an outgrowth of the remote-controlled manipulators used to handle radioactive materials in the nuclear industry.

The evolution of these heavyweight sea monsters often goes on in secret. Rumor has it that America's biggest shipyard, Newport News Shipbuilding and Dry Dock Co., is hatching a herd of the big submersible robots, and the company won't deny it. But when I asked one of their executives about details, he just gulped. To keep competitors from sneaking a look at their mechanical scavengers, some companies keep their gadgets dismantled until they're out at sea.

An industry insider reports privately that a Pittsburgh manufacturer of automatic mining equipment is converting his trackless cutters, loaders and haulers for use in the sea floor.

Toughest part of the job? "It's like bottling whiskey. Gotta cork it tight. Except with whiskey you try to keep the liquid

(Please turn to page 208)

Sears

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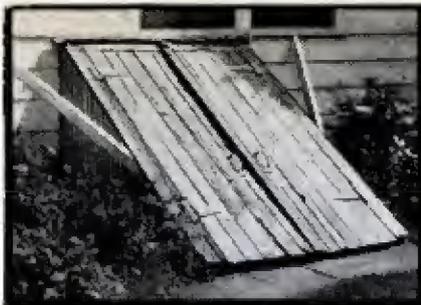
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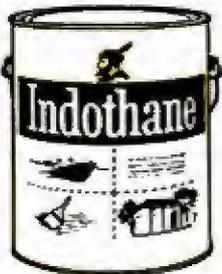
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BIG BUSINESS UNDERSEAS

(Continued from page 206)

in. Here the trick is to keep the seawater out so it won't corrode the working parts."

It is anticipated that some of these undersea machines will carry out complex routines entirely without human supervision—not even shipboard monitors—as commanded by tape or punched cards.

Surprisingly, the most successful sea mining operation so far was carried out with fairly simple equipment. An enterprising Texan named Sam Collins bet on a hunch that South Africa's famed diamond fields also extend offshore. So he bought an old 800-ton tug and installed powerful pumps to suck up bottom mud near the Cape of Good Hope. Within a month he had enough gem-grade diamonds in his sifting screens to pay back the cost of his boat.

Texan after bigger diamonds

But mud-borne diamonds weren't big enough for the ambitious Texan. To pry loose bigger rocks from the ocean bottom, he built a 3800-ton floating device called *Diamantkus* from which massive 16-inch pipes reach down as far as 400 feet. Powerful air jets ring these bottom feelers, blasting encrusted gravel. A suction line pulls loosened rocks aboard.

Experts believe that ocean farming, too, will be fully mechanized. "You can harvest material from the sea floor just like you harvest corn on the surface," says the head of one underseas division.

The toughest problem has already been worked out. It was not technical but legal. To whom did the sea belong? According to international law (page 94, May '66 PM), the continental shelf along the coasts and to "wherever superadjacent waters admits to exploitation" belongs to whatever nation they adjoin. Competition for the ocean floor has already begun on the international level, with France, Britain, Japan, The Netherlands, and the Soviet Union among the main contenders. U.S. scientists are prodding Congress for still more money to stay in the race. Today, these scientists argue, the sea is the last remaining frontier on earth. It holds greater promise than all the frontiers of the past. For beneath the water lies 71 percent of our planet's total area. The rewards of ocean pioneering, some scientists believe, are more immediate than the rewards of space exploration. One eminent member of a Congressional advisory committee—apparently a salty type himself—sums up this viewpoint: "The ocean's bottom is more important than the moon's behind." ★★



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Cut or Tear

DEADLY BOOBY TRAPS

(Continued from page 13)

up with a variation of the antipersonnel bullet mine. Two .45-cal. cartridges are imbedded in a small board which rides on wood dowels connected to a baseboard. Again, nailheads are used as strikers. Once this booby trap is stepped on, its victim is wounded by a bullet in his groin and a second one in the vicinity of his armpit.

Another way the Vietcong have circumvented metal-plated GI boots is through the use of a carefully camouflaged pit in which four needle-sharp punji stakes are set in a square and connected by interlacing wires. The pressure of a boot on the wires forces the stakes to close on the ankle of the victim. The same principle works in another series of foot traps, called "tiger traps," "spike traps" or the "crow's foot." One spike trap consists of a buried box in which flap-type doors bristling with metal spikes close tightly on the vulnerable upper portion of a soldier's boot.

Acting instinctively, the victim pulls back in an effort to extract his pinned foot. Thus the spikes are driven deeper into the wound. Some of these traps occasionally are rooted in concrete, forcing a victim's comrades to dig out the whole works and carry it along with the casualty to the nearest aid station, often under fire.

Every combat unit in Vietnam has collected many types of booby traps that American fighting men have been fortunate enough to discover before it was too late. One Marine outfit near Danang uncovered 43 roughly hewn, metal spring traps, some of them four feet in diameter. When one leatherneck was snared in such a "tiger trap," six of his buddies were unable to release his crushed leg. The booby-trap casualty writhed in agony for two hours before several heavy crowbars could be flown in by helicopter to a nearby landing zone that was under intense enemy fire. It took three men with these bars to loosen the jaws of this trap.

"There's no limit to the Vietcong's imagination," explains Sgt. John L. Saulnier, chief instructor at the Marine Corps booby-trap school that was set up at Danang and is now referred to as the "Punji Palace." Actually, it's a simulated native village that is a display course for the leathernecks who spend a day learning how to avert instant death.

An innocent-looking village gate is checked for a booby trap before it's opened. A grenade (actually a dummy) rigged to explode when the gate opens is not too hard to find. In fact, it's meant to be found. There's generally a second gre-

nade, better concealed. The Palace also places emphasis on other diabolical devices like a 200-pound chunk of bamboo tree trunk that is hung over a doorway. A heavy foot on the hut's threshold unleashes a punji stick-studded deadfall that comes swinging down chest high into the doorway like a fullback plunging through the line. No man can withstand the force of this trap and its deadly spikes.

There are, of course, more prosaic types of booby traps like bottles of native beer. At the Palace two full bottles of beer are sitting on a shelf in one hut, apparently forgotten by hastily departing guerrillas. More than likely, Sgt. Saulnier points out, they contain beer mixed generously with battery acid, formaldehyde and slivers of glass.

Fresh fruits may be injected with snake venom, and ice used for cooling drinks can contain slivers of glass.

The Marines call it a "sick war." Sadistic and sneaky—but effective. "These booby traps are all so simple," Sgt. Saulnier emphasizes. "They work well. From the looks of most of the stuff we've captured, the Vietcong must send their people to Booby Trap U where they learn to use nature itself in designing these things. They also make do with what is available and they can work wonders with bamboo."

Saved by a hair

Unfortunately, there has been a tendency on behalf of many Americans to look down their noses at guerrilla soldiers whom, they claim, "are no match for our boys." However, that's not the way that Pfc. Albert LaVallee of Tupper Lake, N.Y., looks at it. He's a Marine and this is his second war. He fought in the trenches and bunkers of Korea, and when Marines were sent to Vietnam, he decided to reenlist. Actually, LaVallee was lucky in Korea and returned home without having been wounded. His luck held out last year after he stepped into a foot-deep hole rigged with a booby trap. He missed the trip wire by a fraction of an inch and thanks his lucky stars that he wears a size 8 boot instead of an 8½.

"I pulled my foot out quick," he recalls. "I still didn't realize the hole was a booby trap." Again, he barely missed tripping a grenade, "Then I saw it, a piece of fishing line running out the hole and tied to a tree a few feet away. That's when I looked in the hole and spotted the grenade. If I had kicked the trip I'd hate to think of the shape I'd be in now."

With pliable bamboo a part of South Vietnam's natural flora, the Vietcong have

(Please turn to page 212)

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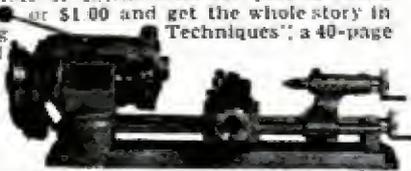
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DEADLY BOOBY TRAPS

(Continued from page 210)

devised any number of effective booby-trap weapons that, even if they don't kill, can seriously wound and possibly demoralize fighting men who are eager to come to grips with an elusive foe. One of the most fearsome devices in the Vietcong's arsenal of bamboo weapons is the punji whip or "Malaysian gate," a rakelike affair that is strained back and tied along a jungle trail. Released by a tripwire, it slams forward, burying an array of knife-sharp stakes in the victim's chest or back.

The Marines have had their share of danger from booby traps as have other fighting men from U.S. Army infantry units. During "Operation Crimp," carried out in January, 1966, the hard-fighting paratroopers of the 173rd Airborne Brigade had to contend with rusty cans hanging chest high from the branches of trees. Hidden by dense foliage, the cans are hard to see. But just brush against one and you set off a devastating blast that rips through flesh and bone like grapeshot. This booby trap, tied motionless with catgut or communications wire, is fitted with a pressure detonator that is sprung once the can is moved from its inert position.

Green and deadly

Still another deadly booby trap, as old as war itself, has caught many an unwary GI and Marine. Bamboo vipers, dark green, three-foot-long snakes peculiar to the jungles of southeast Asia, have been hung from branches over trails used by American troops. Their heads hanging shoulder high, these venomous snakes strike with a hiss. One GI paratrooper walking into a cave in the central highlands was warily feeling his way in an effort to avoid the more conventional booby traps. Suddenly, something from above lashed at his cheek. Something else nipped at his shoulder and a cold, slimy something slid along his neck. He had walked into a curtain of snakes hanging from the cave's ceiling. Hungry, angry, frustrated, they bit the soldier furiously. He died in minutes.

For the Vietcong, there's even the ultimate in this sneaky, effective, sadistic and "sick war." It's the human booby trap. At the Punji Palace leatherneck units that are given this course in guerrilla warfare survival shudder when they hear about the "soda water girl." Each afternoon she peddled cold drinks to Marines stationed in outposts and bunkers outside her village near Danang.

"You buy? You buy?" she'd entreat the

(Continued on page 214)

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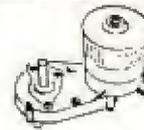
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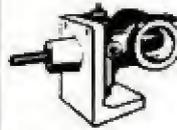
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DEADLY BOOBY TRAPS

(Continued from page 212)

young American fighting men as she passed among them with a beguiling smile. She was about 12 years old and cute as a button. It was a hot day and eight thirsty Marines who had been digging fortifications clustered about the youngster. They didn't notice her fingering something under her loose cotton blouse.

A homemade bomb was strapped to her body.

She triggered the bomb and blew herself to eternity. Six Americans joined her in death. They had no chance to defend themselves; they didn't even die with dignity, facing the enemy. But that's the way it is in Vietnam's booby-trap war.

Two can play at this game

The Vietcong rely heavily on captured weapons. In what might appear to be an act of generosity bordering on treason, U.S. Special Forces combat patrols are "giving" weapons to the enemy. What they do is leave behind cartridges that blow up in Vietcong guns when they are fired, mortar shells that backfire and kill gun crews, and grenades with fuses so short they go off before they leave the hand of a guerrilla trying to throw one.

One particularly devious device is a fake 105-mm shell which "fails" to explode when it strikes the target area. Invariably, the thrifty Vietcong think it's a dud and send a team to recover it so as to use its fuse later in a land mine. But inside is a time bomb that goes off after the enemy has cached the shell.

A high—or low—point in Vietcong trickery was reached last October when reports were broadcast that some of the souvenir dolls that Americans had sent home to their families were booby-trapped. Police departments throughout the United States were called by alarmed recipients of the death dolls to take them away. U.S. Army, Marine and Navy demolition experts were called in to investigate. Finally, the "all clear" was given. None of the dolls was booby-trapped. That's the official explanation.

But a Navy chaplain believes otherwise. Lt. Evan Greco, "the flying father" who served aboard the aircraft carrier *Coral Sea*, recalls a close call he had with the souvenir dolls. "A lot of guys on the ship had bought the dolls for their families and friends back home," he explained. "I had one of them myself." Then several blew up aboard the ship and the ammo handlers with demolition training collected them for disarming. Like the "soda girl," the dolls were cute—but deadly. ★★★

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by Whitey Ford

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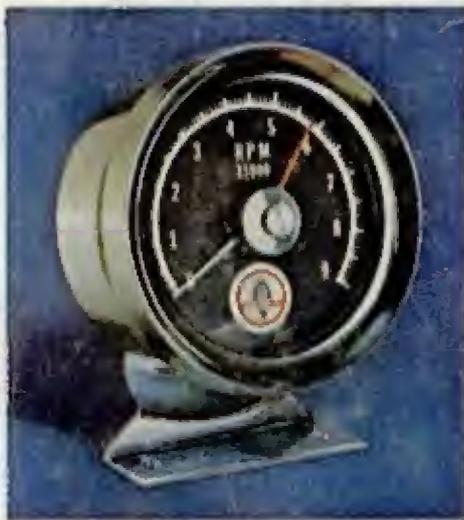
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